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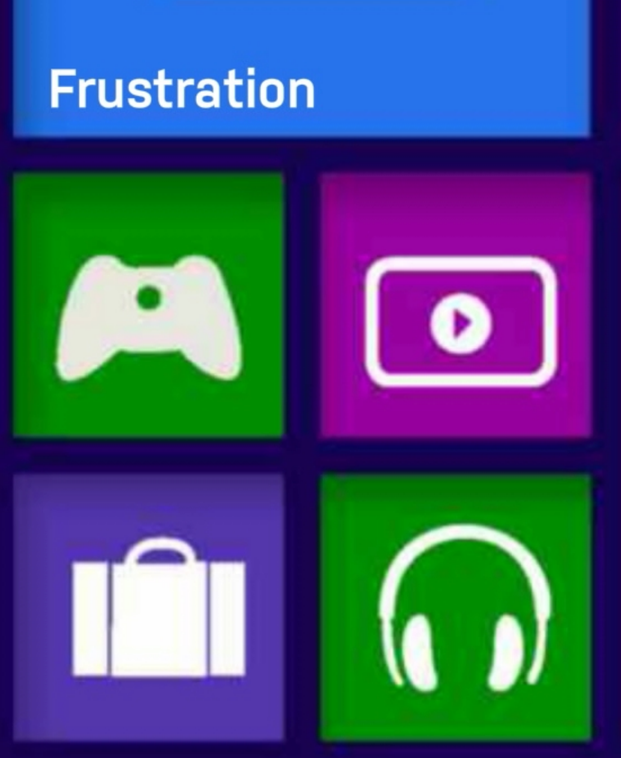

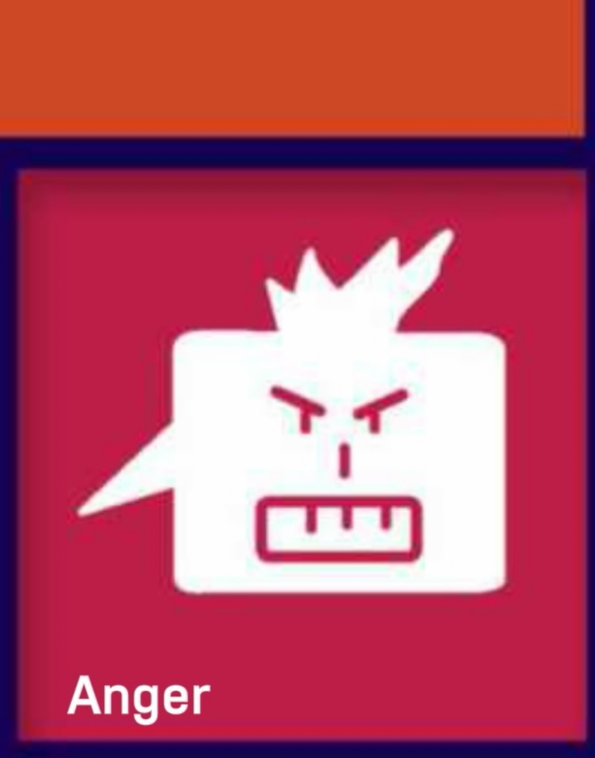

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Gordon Mah Ung

MY 2014 PREDICTIONS

WHY DO JOURNALISTS like to make year-end predictions? Because, like weather forecasters, no one ever remembers how completely wrong we were because, oh look, pretty colors. And thus, I present my technology forecasts for the year 2014.

Clearly, the big battle that will consume headlines for months will be the console wars. PS4 wins on frame rate but its launch titles are weak. Xbox One has a lot of baggage to overcome but it's the more forward-looking console with a better launch lineup. However, 2014 will also see the first SteamOS boxes emerge in both pre-built and DIY configs (I'm already mentally making one) to battle for the living room. My prediction: Xbox One by a hair, but Steam Box adoption rates will really take us by surprise.

Of course, there's also the battle between Battlefield and Call of Duty. By early 2014, the publishers will have whipped out their sniper rifles to see whose is the longest and which outsold the other. I believe Call of Duty will outsell Battlefield. It's no surprise that consoles drive game sales these days and, well, as a former editor/CoD fanboy said to me of Battlefield: You have to think too much for that game. My prediction: CoD in sales, BF4 in fan loyalty (and bugs).

Intel's fight with ARM will continue unabated in 2014, with Bay Trail and Intel's 14nm Broadwell finally appearing. My prediction: No changes that move the needle. ARM will continue to be the champion in tablets and phones, not because of performance or power consumption but because ARM chips are practically free next to their x86 counterparts. Hell, I got an eight-core Cortex A15 in my cereal box this morning. As much as either side wants to see one side crush the other in one year, it won't change at all in 2014.

There's been talk about Microsoft pushing its next OS out to 2015. My prediction: Windows 9 will make its debut at the end of 2014 and despite talk of Microsoft unifying phone/tablet and desktop, I predict Microsoft will actually back away from forcing desktop users to use a touch interface. The company doesn't have much of a choice, either. As obstinate as Microsoft can be, the opposition to the Modern interface from its actual customers, not the customers it wishes to have, has been heard loud and clear by the company.

My last prediction is based on the stories I've read by Wall Street analysts and the mainstream tech media that the PC is dead. My prediction: 2014 will be a nice comeback year as people upgrade older Windows XP machines that are no longer supported and more people realize that the PC ain't going nowhere.

Gordon Mah Ung is Maximum PC's deputy editor, senior hardware expert, and all-around muckraker.

↘ submit your questions to: comments@maximumpc.com

THE NEWS

Big Kepler Finally Arrives

Nvidia's fully unlocked GK110-based GTX 780 Ti sets new benchmark records

FOR MOST OF 2013, the Nvidia GTX Titan has ruled the single-GPU roost unchallenged, but that all changed last month with the launch of the AMD Radeon R9 290X. That smoldering GPU dethroned the GTX 780 and displayed performance close enough to Nvidia's flagship GPU to make the green team just a wee bit uncomfortable. So it did what any hypercompetitive GPU maker would do: It released a new GPU that would erase all doubt as to who makes the fastest single GPU in the world. That, in a nutshell, is the GTX 780 Ti. It is faster than the R9 290X, and faster than the GTX Titan, and therefore is the fastest GPU for gaming Nvidia has ever created. As for why it's not named Titan Ultra or some other Titan derivative, it can't do Double Precision Compute like the Titan, making it more akin to the GTX 780, hence the name.

The "Ti" part of its name refers to the fact that it's a super-charged version of the GTX 780. Not only does it have higher clock speeds and faster 7GHz memory, but it also has three additional SMX units enabled, allowing for a staggering 25 percent increase in CUDA cores, going from 2,304 to 2,880 total. For those keeping track at home, that's 15 SMX units total, which is the full amount possible in the GK110 die. The almighty GTX Titan has only 14 and the GTX 780 has 12, so for the first time we are seeing GK110's fully armed-and-operational power, and it's awesome to behold. The GTX 780 Ti has 3GB of 7GHz GDDR5 memory, too, endowing it with significantly boosted memory bandwidth, despite using the same 384-bit memory bus as the GTX 780. But the card costs $700, so it has a hefty price tag to match its performance.

Despite its prodigious power, it's still a Kepler board, so it's extremely efficient. Nvidia claims its TDP is 250 watts, the same as the GTX 780 and the GTX Titan. In testing, it remained cool and quiet at all times, never going beyond 85 Celsius when highly overclocked—that's 10 C cooler than the Radeon R9 290X at stock clocks. It hovered around 82 C at its stock boost clock of 928MHz. We were able to juice our review board up to 1,225MHz Boost clock, and we think that should be achievable on most retail boards. Nvidia's Kepler boards have always been highly overclockable.

In testing, the GTX 780 Ti spanked everything it went up against, ending the Radeon R9 290X's short-lived time in the limelight. We were actually surprised by how much faster it was than not only the R9 290X, but the Titan as well. On average, it was anywhere between 10 to 25 percent faster than a Titan at 2560x1600 resolution, where it was able to hit the magical 60fps mark for the first time in Battlefield 3 and Call of Duty: Ghosts.

The fact that it can kick so much ass while still being relatively cool and quiet makes this the most well-rounded and powerful GPU Nvidia has ever released. The timing is fitting, too; we expect this to be the last Kepler card we'll ever see, as the company is beginning its transition to a 20nm lithography for the upcoming Maxwell architecture. **–Josh Norem**

The GTX 780 Ti is a flagship card top-to-bottom; it's faster and more expensive than any other gaming GPU available.

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Tom Halfhill
Fast Forward

AMD'S CONSOLE COUP

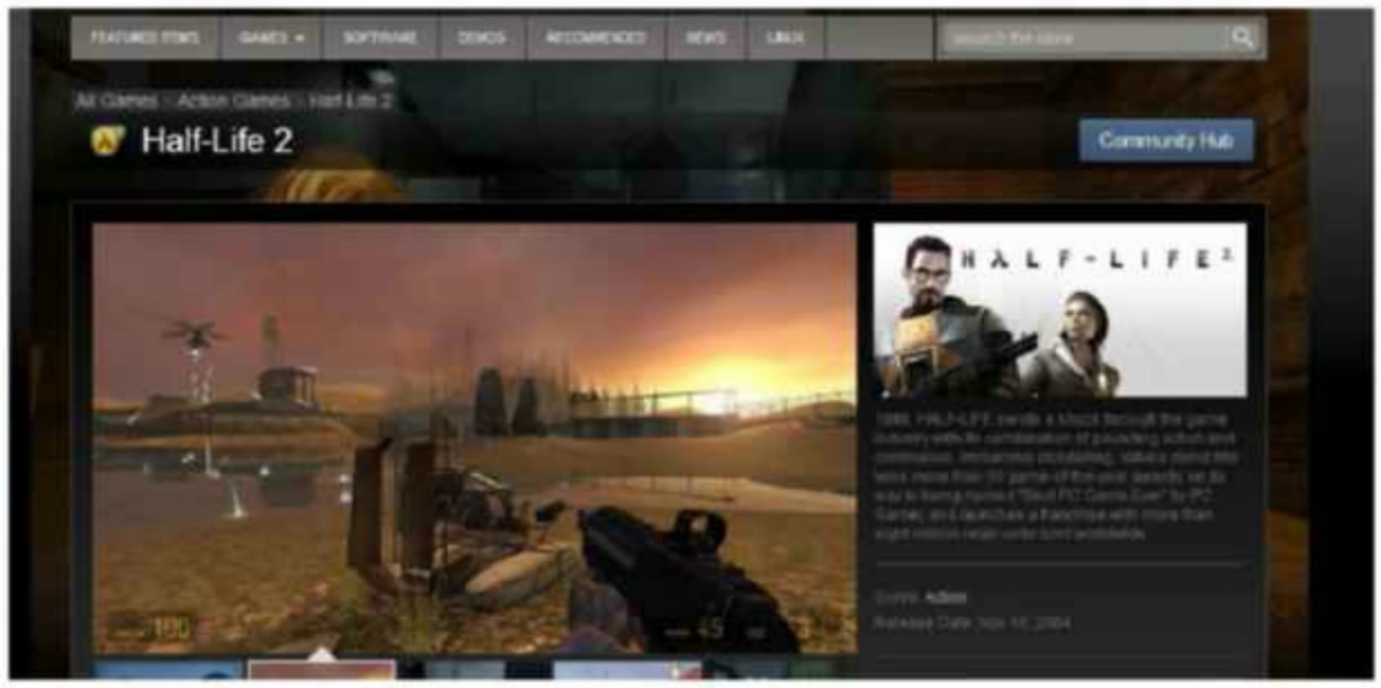
VIDEOGAME CONSOLES have advanced light years since an off-the-shelf 8-bit processor powered the seminal Atari 2600 in the 1970s. The latest consoles from Microsoft and Sony will have custom 64-bit processors with eight CPU cores, integrated graphics, and megabytes of on-chip memory. In the PC world, "integrated graphics" usually means "sucky graphics," but Microsoft's Xbox One and Sony's PS4 deserve respect. Ten years ago, Hollywood studios needed million-dollar render farms to generate graphics this good.

Surprisingly, AMD designed the main processors for both Microsoft and Sony while also contributing the GPU in the processor that IBM created for Nintendo's Wii U console. These high-profile design wins are surprising because AMD has struggled to keep up with Intel's PC and server processors in recent years—yet all three videogame powerhouses chose AMD to design vital parts of their next-generation consoles. For the console vendors, these are practically bet-the-business gambles, because a borked design could turn any of them into the next Sega.

So, why did they bet on AMD? Evidently, the company's troubles aren't for lack of engineering talent. When infused with enough development cash, AMD can design processors that redefine the state of the art. If AMD's videogame processors are successful, they offer new hope that the company can become a stronger sparring partner in the PC ring with Intel.

It helps that both the Xbox One and PS4 processors use AMD's x86-compatible Jaguar cores and Graphics Core Next (GCN) architecture. (Nintendo's Espresso processor has AMD graphics but uses IBM Power Architecture cores.) Although these chips are proprietary and won't appear in PCs, the experience AMD has gained will improve future chips for PCs, servers, and graphics. Its success should also attract additional custom-chip customers, bringing AMD some much-needed cash.

Tom Halfhill was formerly a senior editor for *Byte* magazine and is now an analyst for *Microprocessor Report*.



Steam Reaches 65M, Passes XBL

Valve Software, makers of the Steam game distribution platform (and some games you may have heard of, like Half-Life, Team Fortress, and DotA 2), announced that it has reached 65 million accounts. This leaves Microsoft's Xbox Live platform well behind at 48 million, though that number will probably get a boost with the release of its next console. Steam's numbers are up 30 percent from a year ago, and the service just celebrated its tenth anniversary, making it one year younger than XBL. Valve still has SteamOS, Steam machines, and its Steam controller coming out some time in 2014, so its user base is expected to continue steady growth. **–PL**

Store Data for a Million Years

While storage capacity has exploded since the dawn of the computer age, the lifespan of our magnetic and optical media has remained stagnant. But the *MIT Technology Review* reported in November on a disk that could store data for literally a million years. The researchers' estimation is based on simulating aging by exposing the storage medium—tungsten protected by a layer of silicon nitride—to extreme heat for one hour. These materials were chosen for their high melting points and ability to minimize the expansion and contraction caused by fluctuating temperatures. The researchers, led by Jeroen de Vries at the University of Twente in the Netherlands, say this is just a test case for more sophisticated designs. **–TM**

Amazon Announces Sunday Deliveries

Online mega-retailer Amazon announced in November that it has started a pilot program with the US Postal Service to deliver packages to customers on Sundays. At press time, the program was limited to New York City and Los Angeles, with plans to expand to Dallas, New Orleans, Phoenix, and Houston sometime in 2014. Contrary to initial reports, the program is not limited to customers of Amazon's Prime service (for which users pay $79 annually to obtain free two-day shipping on a large number of items). Financial details of the arrangement with the USPS were not disclosed. UPS and FedEx do not deliver on Sundays, but Amazon invited them to reconsider that policy. **–TM**

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Thomas McDonald
Game Theory

AN ARMY OF BETA TESTERS

I'VE ALWAYS tried to avoid beta software, since unfinished code is just a pain. Now, however, people are lining up in fairly astonishing numbers to pay for the honor to mess about with incomplete, bug-riddled games. As of this writing, 255,000-plus beta copies of Prison Architect have been sold for a total of more than $8 million. I expect that Sir, You Are Being Hunted is doing similar numbers.

I single out these two titles because I've broken my long-standing "no-betas" rule to play both. Neither is finished, but I'm eager enough to try each that I'm willing to put up with the rough spots. And, apparently, hundreds of thousands of gamers agree. Why are so many people paying to experience unfinished work full of tiny irritations, poor play balance, gaps in content, and other flaws?

Part of it may have to do with just wanting to be there first, but were that many people jumping up and down, set to pee their pants, waiting for the arrival of Prison Architect? Hardly.

I guess it's possible that a quarter million people paid $30 because they wanted to play an unbalanced, glitchy game in which your prisoners take their meals into the shower while their heads are replaced with toilet sprites, but... probably not.

Perhaps what we're really seeing are the stirrings of an ownership economy in which PC gamers are understanding that their format relies on them, not the marketers or publishers or chain stores. It's more than just a "Kickstarter effect." It's the realization that, for good games to thrive on this platform, the people have to step up and finance them.

Economic rules are being rewritten all across the globe, as people shocked by the spectacular failures of Big Things (businesses, banks, countries) take the initiative to invest in the Small Things. A quarter million people isn't just a batch of over-eager fans. A quarter million people are an economy, and they're making their own rules now.

Thomas L. McDonald is Editor-at-Large of Games Magazine.

HGST Releases 6TB Helium Drive

HGST, a subsidiary of drive maker Western Digital, has announced that it's shipping a 6TB mechanical drive to data centers around the world. This jumbo unit is filled with helium, instead of the usual oxygen-based air. Helium has less air resistance, so the drive motor doesn't have to work as hard to reach its rated speed, saving on electricity. This also means less heat and less noise. At press time, HGST did not have a retail release date or price. But the drive has 50 percent more capacity than the next-largest drive, so it should command a premium. **–PL**

Microsoft Declares PC Gaming Allegiance

Even as Microsoft prepared for the launch of its next console in November, Phil Spencer, vice president of its gaming studio, told the website Shacknews that Microsoft has found renewed interest in PC gaming. At an Xbox One preview event, he said, "We probably have more individual projects on Windows than we've had in 10 years at Microsoft Studios." Spencer also asserted, "We're starting to look at bigger and core gamer things," rather than the large number of more casual titles that were launched alongside Windows 8 in late 2012. Not surprising, given the billions being made from Grand Theft Auto and Call of Duty. Company reps have talked like this before, so we'll wait and see. **–PL**

Tech Tragedies and Triumphs

A monthly snapshot of what's up and down in tech

TRIUMPHS

NVIDIA
The R9 290X was the fastest GPU around—for about four days or so, until the GTX 780 Ti launch.

SAMSUNG
Upstart Apple-copier (we kid) now accounts for two-thirds of all Android devices globally.

MICROSOFT
Apologized for turning its back on PC gamers, says it "lost its way" but is going to make things right. Fool me once....

TRAGEDIES

BLOCKBUSTER
Judgment day finally arrived for this beleaguered video rental chain. Good thing we never paid those late fees.

APPLE
Shuts down inventory tracking site that listed what was in stock at local retail stores. WTF, Apple? Oh, right.

BATTLEFIELD 4
We love us some BF4 but the *beta* was more stable than the final release, for crying out loud.

"stupidly fast and small"
- Maximum PC

"the Falcon Northwest Tiki is worth it "
5/5 - Matt Mira, G4TV

"It's small, quiet and extremely fast"
100 Best Products of 2012
-PCWorld

"The Perfect PC"
- Forbes

"Tiki is one of the most awesome desktop designs we've seen in a long while"
- Toms Hardware

"One of the best boutique computers on the market today"
- Digital Trends

"small, powerful and surprisingly affordable"
-PC Gamer

"the Tiki is whisper quiet and runs cool as ice."
- Destructoid

"It's rare that we are so impressed with a piece of equipment, but Falcon Northwest's Tiki inspired awe from everyone who used it."
- John Breeden II, Lab Director, Government Computer News

"no other system comes close in terms of style."
-Houston Chronicle

"For a user like me, the GeForce Titan in Falcon's Tiki is pretty much as good as it gets."
- Anand Lal Shimpi, AnandTech

"more computing power per cubic inch than anything else I could name."
- The Tech Report

"We love the Falcon Northwest Tiki"
9/10 - NeoWin

Tiki

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Quinn Norton
Byte Rights

HERE WE GO AGAIN—TAFTA

ANOTHER YEAR, another transnational agreement throwing out people's rights and democratic choice in favor of corporate control, only to be review in special courts—all getting negotiated in secret. This one is called TAFTA, the Transatlantic Free Trade Area (aka TTIP, Transatlantic Trade and Investment Partnership), and one of its most important areas is the intellectual property (IP) chapter. "IP chapter," at this point, is code for controlling the Internet. (And access to healthcare, but we're focused here.)

Just as the Transpacific Partnership (TPP) chokes off Internet freedom in Pacific nations, the effort off the east coast is getting underway. TAFTA will allow intellectual property holders and other corporations to override domestic law in trade courts largely controlled by industry and regulatory bodies derived from industry, since that's where they always get experts. I can't tell you how bad the IP draft is, because like ACTA and TPP before it, this latest monstrosity is being negotiated in secret.

Well, kind of secret. Corporations are allowed to see drafts, comment on negotiations, and make proposals. It's just secret for you and me, the mere people that must live with it. I'm going to go out on a crazy speculative limb here and say it's terrible, based on CFAA, DMCA, COICA, SOPA, PIPA, CISPA, ACTA, TPP, and dear god, I'm running out of letters.

It's pretty clear after the crashing and burning of these laws and treaties in recent years why these agreements are done in secret—because everybody hates them.

Democracy is an inconvenience for the IP cartels, since the public has made it clear they want a free, open, and sharing Internet, and artists and other creators are making it clear that they are happy to go around the cartels and connect with people directly. What's a poor little billion-dollar multinational to do, but subvert democracy to maintain control?

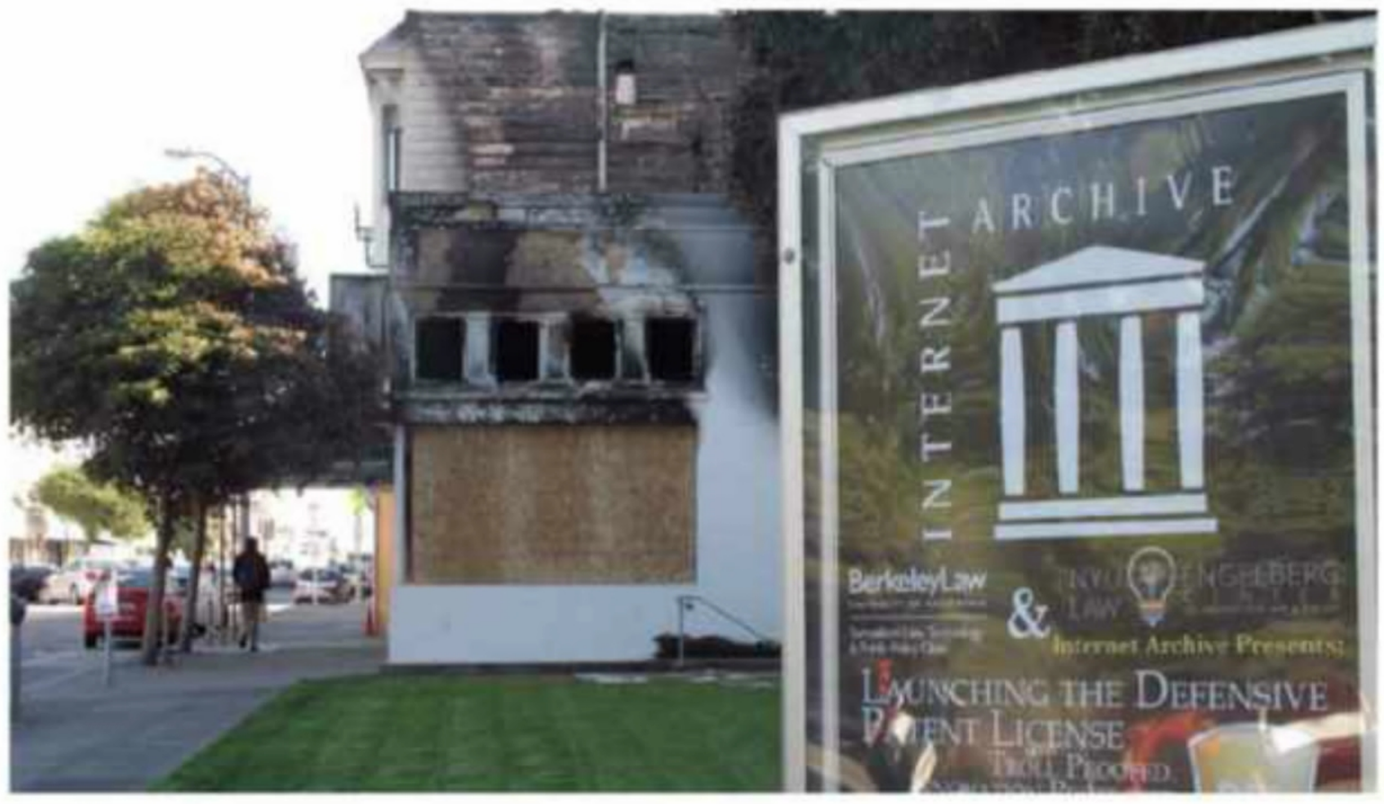
Quinn Norton writes about copyright for Wired News and other publications.

Fire Damages the Internet Archive

The Internet Archive, billed as the "digital library of the Internet," suffered an estimated $600,000 worth of damage in a fire at its San Francisco scanning center in November. The fire occurred in the middle of the night, so no one was hurt, and authorities do not suspect foul play. The bulk of the price tag comes from the expensive equipment that the nonprofit group uses to convert physical media to a digital format. Some material that had not been converted yet was lost in the fire, but all of its digital data survived unscathed (which is stored redundantly at multiple locations, anyway).

The 1,300-square-foot scanning center building itself will also need to be repaired or even rebuilt. The Archive has 29 other such centers, so its work can at least continue while it gather funds and make plans to recover. It was also able to repurpose other equipment to continue scanning at its San Francisco offices (where the scanning center is just one of several buildings). The casualty list also includes 20 boxes of books, plus cameras and lights. Some of the books were deemed irreplaceable, but insurance will cover some of the loss of the hardware.

Internet Archive is the home of the 364 billion–webpage Wayback Machine, which allows users to see a variety of popular websites as they looked several years ago. Readers who want to help the Internet Archive become fully armed and operational once more can donate on its website: https://archive.org/donate. Options include PayPal, Amazon, and even Bitcoin. **–TM**



LA's Free Internet Questioned

The city of Los Angeles announced in November that it was planning to deliver free broadband to its inhabitants. However, the details of the plan drew some detractors. Under the city's terms, the projected cost of up to $5 billion would be absorbed by the vendor, rather than paid for by taxes or municipal bonds. The vendor would also have to lease access to third parties, as with DSL. Harold Feld, senior VP of the technology-focused consumer advocacy group Public Knowledge, told tech news site ArsTechnica, "I look forward to their RFP [request for proposal] for a unicorn supplier, because I think it's about as likely under these terms." **–TM**

Extend MS Office Trial to Six Months

If Microsoft Office 365's 30-day trial isn't long enough for you, you can extend it in a few easy steps, according to website How-To Geek. Navigate to C:\Program Files (x86)\Common Files\Microsoft Shared\ on your Windows drive (or C:\Program Files\Common Files\Microsoft Shared\ if you're using a 32-bit version of Windows), hold down the Shift key, right-click the folder labeled OfficeSoftwareProtectionPlatform and select "Open command window here." Type **osppreparm.exe** and hit the Enter key. You'll need to do this once every 30 days to extend your trial to its upper limit of six months. **–PL**

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THE LIST

9 BEST MILITARY-THEMED SHOOTERS

9 CALL OF DUTY 4: MODERN WARFARE

Say what you will about the yearly rehashes, but the original Modern Warfare was a groundbreaking blockbuster.

8 DAY OF DEFEAT

One of the most popular Half-Life mods of all time, Day of Defeat is beloved for its super-fun team-based mission objectives.

7 AMERICA'S ARMY

While America's Army isn't the most fun shooter on this list, it's easily the most realistic, being developed by the Army itself.

6 RED ORCHESTRA: OSTFRONT 41-45

Winning Nvidia's Make Something Unreal Contest, the Red Orchestra developers were able to craft a cult classic.

5 ARMA 2

Battlefield 4 might have big multiplayer maps, but they're nothing compared to Arma 2's gargantuan open world.

4 MEDAL OF HONOR: ALLIED ASSAULT

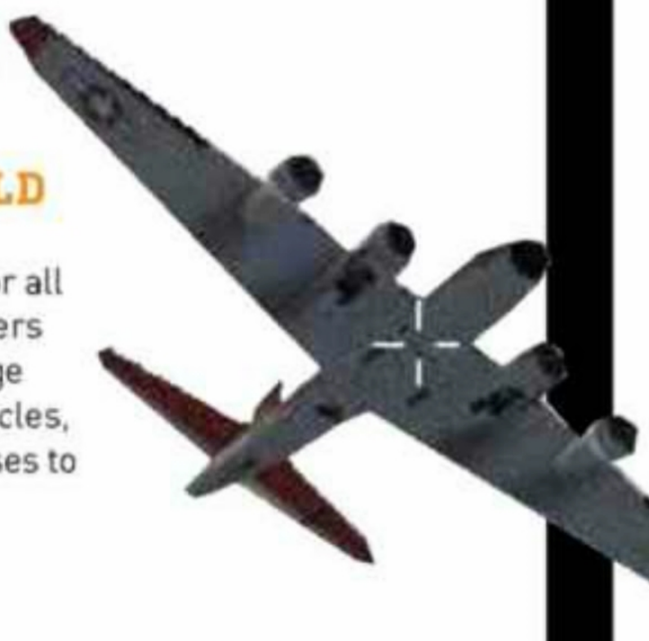
Heavily influenced by *Saving Private Ryan*, it really feels like you're playing through the epic WWII movie.

3 COUNTER STRIKE

What started off as a Half-Life mod in the late '90s has evolved into one of the most iconic and revolutionary shooters of all time.

2 BATTLEFIELD 1942

It raised the bar for all multiplayer shooters by introducing huge maps, tons of vehicles, and multiple classes to choose from.



1 WOLFENSTEIN 3D

This may not be a traditional military shooter, what with all its sci-fi elements, but the OG FPS deserves special mention on this list.

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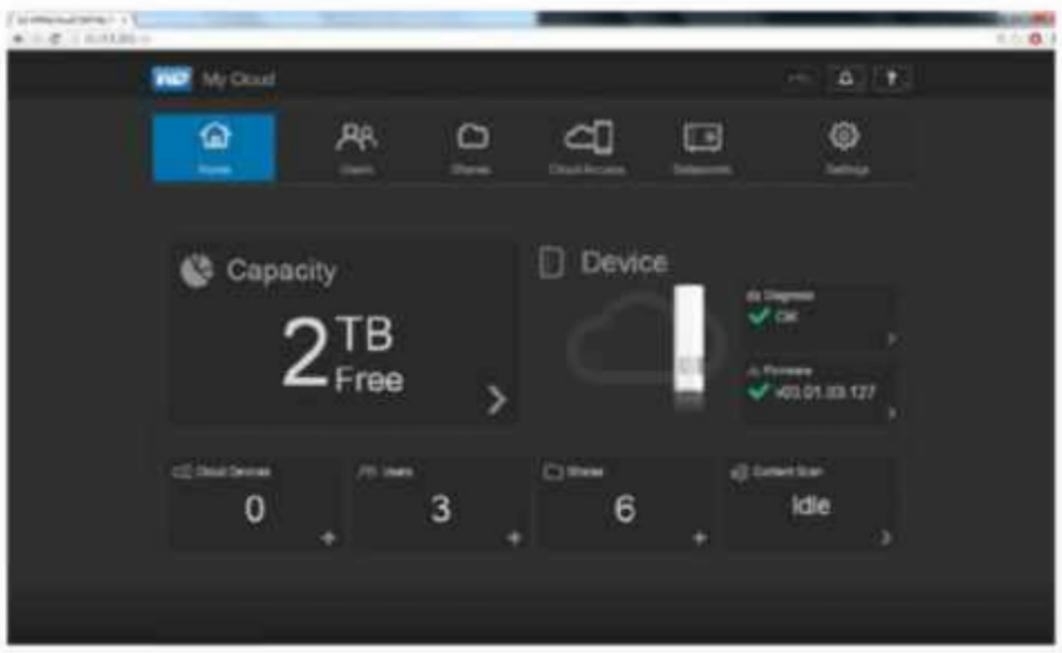
HEAD TO

BY CLARK CRISP

Dropbox vs. Western Digital My Cloud

Every power user has hopped on the cloud storage bandwagon because it's awesome having all your files synced to any Internet-connected machine, but there are two problems. First, we have some privacy concerns; second, it's ridiculously expensive. WD's new My Cloud addresses both of these issues by being dirt cheap (by comparison) and by storing all your data on a "personal cloud," also known as a NAS drive. It's time for a clash of the clouds!

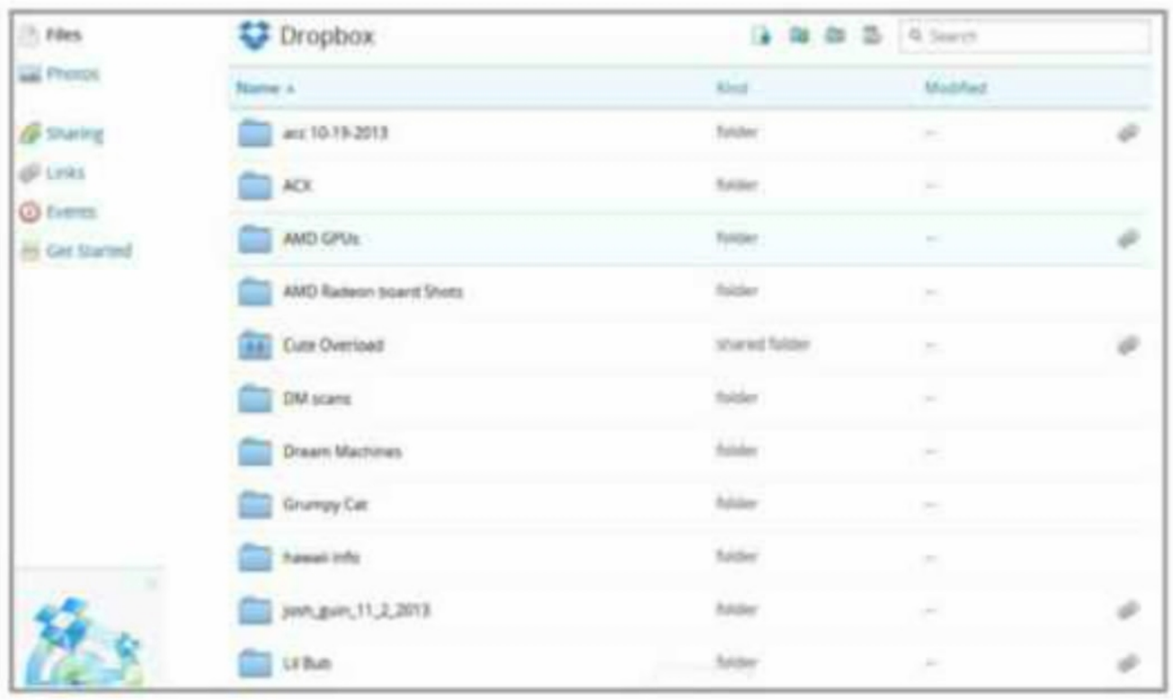


WD My Cloud is part of the new "personal cloud" movement, i.e., NAS drives that you can easily connect to from anywhere.

ROUND 1	ROUND 2
Cost	**Ease of Use**
Dropbox first entices you with 2GB of free storage for signing up. For each friend you convert to Dropbox, you earn an additional 500MB, with a maximum capacity set at 18GB of free storage. If this still does not satisfy your appetite for storage, Dropbox offers 100, 200, and 500GB options with a linear cost progression; for each dollar you pay, you get one gigabyte of storage (yearly). My Cloud blows this model out of the water by starting at $150 for a 2TB drive, so My Cloud offers 13 times the storage capacity per dollar. The My Cloud also lets you add an external USB 3.0 hard drive for even more storage, pushing the dollar-to-gigabyte ratio even further in its favor. My Cloud will also soon offer a 4TB drive, making it by far the least expensive "cloud" backup option available. In this category, the My Cloud wins by a landslide.	Western Digital makes it easy for even the most novice networker to set up and configure his or her own slice of the cloud. You can easily connect to the My Cloud from any computer on the Internet, and uploading and retrieving files is also straightforward. Granting users access and permissions is also streamlined and simple, making it the slickest NAS we've ever tested. It also includes mobile apps, as well. Kudos to My Cloud, but there's good reason why Dropbox has over 175 million users: It's arguably the slickest cloud storage solution available. Configuring Dropbox is painless and uploading files is as easy as dragging-and-dropping into a folder. As soon as you sync files, Dropbox notifies you of any changes to shared files, and sharing is as easy as right-clicking a file and copying the share link. It's a tough call, but we give the win to Dropbox since it provides more info to the end user.
Winner: My Cloud	**Winner: Dropbox**

HEAD

Dropbox was the first company to make file sharing easy (in our opinion), but paying $1 per gigabyte hurts.



ROUND 3

Security

My Cloud consists of a single hard disk inside the device, so it does not offer any type of redundancy. WD is planning on adding multi-bay devices with RAID support in the future, but for now it addresses this issue with a feature called Safepoints, which are basically images of the device you can save to a different volume in case of failure. You can save one anytime, and also configure the interval at which future Safepoints are created. Dropbox, on the other hand, is even more secure. It sports Secure Sockets Layer (SSL) and 256-AES encryption for data transfers and storage. Files are stored in Dropbox servers all over the world, too, so it's as redundant as a data center. There is even an option for two-step verification, which the My Cloud does not offer. With features like these, it's hard for anyone to wrestle this crown away from Dropbox.

Winner: Dropbox

ROUND 4

Performance

Since these are both network-attached products, their performance is somewhat dependent on the speed of your network. When copying files to My Cloud we measured impressive 79MB/s read and 62MB/s write speeds. We were able to stream music and movies to remote devices with no issues, but when uploading a file remotely, we experienced speeds no greater than 100KB/s. Dropbox syncs and stores files to your boot drive, but files are sent to Dropbox's servers before syncing to your local storage, so it's at a disadvantage here. What's more, Dropbox automatically throttles itself to 75 percent of the maximum network bandwidth for uploads. On the other hand, we do appreciate that Dropbox allocates even less bandwidth for syncing, so large file transfers don't choke our Internet connection. But ultimately, Dropbox can't compete with local storage when it comes to speed, so this one goes to My Cloud.

Winner: My Cloud

ROUND 5

Features

When logging into the My Cloud desktop app, you are greeted with an easy-to-navigate interface. WD makes it easy to create user accounts, grant share access, and establish Safepoints in the event the drive fails. There are also options to reset the device, back up your iTunes and Dropbox folders, perform system diagnostics, and more. In general, WD's My Cloud offers a comprehensive set of tools for configuring and administering a NAS unit that anyone can use. Dropbox offers selective and LAN syncs, screenshot sharing, bandwidth allocation, options to connect to proxies, and supports a variety of mobile platforms such as iPhone, iPad, Android, and Blackberry. Both services offer desktop and mobile clients along with the ability to share folders with multiple people, but My Cloud is more full-featured. Plus, we like its backup features and diagnostic tools as well, which are just not part of the Dropbox experience.

Winner: My Cloud

And the Winner Is...

We all love and use Dropbox daily, but as a storage solution for a few hundred gigs or more of data, **Western Digital's My Cloud** is the victor. Along with its abundant NAS features and configurability, it takes the win by being extremely easy to use, just like Dropbox, but also more affordable and expandable. For a few gigs of files, Dropbox still reigns supreme, but for larger amounts of data, My Cloud is the better option.

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Work easy, play hard Windows 8

DOCTOR

THIS MONTH THE DOCTOR TACKLES...

> 255 C CPU?!
> Surface Power Cables
> 300TB Storage Volumes

Is My CPU Melting?!

I have an AMD FX -8120 processor on an MSI 990FXA-GD65 motherboard with 16GB of Patriot RAM. Sometimes when my PC boots, Core Temp reports a CPU temperature of 255 C, which causes the CPU to throttle to 1.4GHz. When I reboot, it returns to normal. I've scoured the Internet, emailed with AMD and MSI, and have only tried one thing that made sense. I set the Windows power setting to High Performance, and set minimum CPU power to 100 percent, which should have set the CPU clock cycle to 3.1GHz.

The Internet forums I've found claim that because the temp is reading 255 C, the BIOS is stepping down the CPU to its lowest cycle even if Windows set that minimum higher. That doesn't make sense, as I would hope the BIOS shuts down the rig if the temperature is 2.5 times the boiling point of water. This happens intermittently, and I've gone months without it occurring. But this week it came back three times.

—Marty

THE DOCTOR RESPONDS: Your CPU isn't actually hitting 255 C, of course. 255 happens to be the highest possible value of an unsigned 8-bit integer, which is probably what the sensors use to report temperature, so it looks like a software error. This seems to happen with some regularity on MSI boards and FX-class AMD CPUs, if forum threads are any indication. Per an AnandTech thread, it looks like the CPUs are drawing more power than the board can provide (especially at startup), so to prevent damage to the MOSFET, MSI has the sensor report a reading of 255 C so the CPU throttles down and draws less power. The weird thing is that this happens more often with the FX-8350 on a 970 board than the earlier FX-8120 on the 990FX, but either way, it looks like an issue MSI is aware of.

Since this seems to be an inherent flaw with the board/CPU combination, you could try RMAing until you get a combo that works, but the fact that this is intermittent is interesting. The Doc doesn't know the cooling setup in your rig; it's possible that pointing a fan directly at the MOSFETs (left of the CPU) can help keep them cool during high power draw, which hopefully would stop triggering the failsafe that's making your temp sensors read 255 C. You could also try undervolting your CPU core voltage.

It's Not a Clown Car

I am considering adding a second EVGA GeForce GTX 590 to my system for around $300. I am currently running an Asus M4A89TD Pro motherboard with an AMD FX-8150, a GeForce GTX 590, a 750W PSU, 16GB of memory, and Win 8.1. The problem I'm facing is that my motherboard officially supports CrossFire but not SLI. Before I bought my GTX 590, I had two GeForce GTS 450s in SLI using Hyper SLI in Win 7. I am not sure if Hyper SLI will work with Win 8.1 and quad SLI. I know that if I choose to upgrade I will need a new PSU, around 1,000–1,200 watts. My budget is around $300–400 on the graphics card. What do you think, is the upgrade worth it?

—Daniel Tassone

THE DOCTOR RESPONDS: This is one of those hardware experiments that probably wouldn't work, and even if it did, it would be too loud and expensive to really be a satisfying long-term solution. We admire your chutzpah to consider it though, as stuffing four GPUs into a box that theoretically only supports one is ballsy, so kudos for that, but we think this one is a bridge too far. First of all, we understand that Hyper SLI can support two GPUs, though we have never tested it, but we really doubt it would support four GPUs. And even if it did, we can see that second card not scaling very well at all, as in our own tests we've seen SLI scale well up to three GPUs, but the fourth GPU is usually more of a space heater than an equal partner in the SLI arrangement. Our advice is to not get that second card, but instead just get a GTX 770 (now just $329) or a Radeon R9 290/280X, and not only will you not have to upgrade your PSU, but you'll be able to game in relative silence.

Can't Defrag System Reserved

I recently upgraded from 64-bit Windows 8 Pro to 8.1 Pro. Windows 8.1 is giving me weird issues with the System Reserved partitions on my Samsung 840 SSD. Two System Reserved partitions appear in Disk Management, and one appears in Disk Optimizer, but I can't optimize or defrag it. Yet it will optimize drive C: on the SSD where 8.1 is.

—Keith Brooks

↘ submit your questions to: doctor@maximumpc.com

THE DOCTOR RESPONDS: Don't worry about it. They appear empty to Windows because they're supposed to. They're System Reserved partitions that Windows uses for the boot manager, among other things. You don't need to optimize them or rename them or defrag them, or do anything to them. Just leave 'em alone. It's a little annoying that one shows up in Disk Optimizer, but you don't actually need to optimize it.

In fact, you should make sure you aren't accidentally defragmenting your SSD when you perform Disk Optimization. Normally, Windows disables defragmentation on SSDs automatically, but it looks like there's a bug in Windows 8 and 8.1 that can cause Disk Optimizer to defrag SSD partitions as part of its scheduled maintenance. You should exclude your C drive from scheduled maintenance to prevent excessive wear, as the drive should still Trim regularly on its own.

Stupid Mobile Graphics Drivers

I am having hard time updating my Nvidia drivers. Every version after 314.22 has failed to install successfully. My laptop is an Asus G74Sx with a GeForce GTX 560M in it. I've had no issues on it since I bought it.

—Yevgeniy Iv

THE DOCTOR RESPONDS: It's always frustrating dealing with notebook graphics, especially since it looks like Asus hasn't shipped an optimized graphics driver for your laptop since February 2013. Still, the drivers directly from Nvidia should work, and it sucks that they don't. Have you tried completely uninstalling your old drivers before installing the most recent ones, or checking Custom on installation and selecting "clean install"? If not, you should. Another possible solution you might want to try is to source the drivers from Laptopvideo2go.com instead. Also, Asus has issued two BIOS updates since the laptop was first introduced, which might be worth a shot as well.

Can't Reach the Wall

I use the Surface Pro every day, but the power adapter it comes with is only two meters long. I have the standard 48W power adapter. Every time I see a MacBook with its much longer power adapter cable, I get jealous. I have asked the techs in the Microsoft Store and they say there is no way to extend the cable. I have searched the web and found no answers there either. I don't want to haul around another power strip just to plug this in where I want.

The part that goes from the brick to the wall seems to be about six inches long. Is it a standard adapter that I can replace with something a few feet long? What do you recommend?

—Jason Brooks

THE DOCTOR RESPONDS: The Doc went to the local Microsoft Store to see the adapter in person. Looks like it's a standard C7 two-prong AC power adapter, which you can get from Monoprice.com (for example) for under $4, in lengths from three to 15 feet. Long enough for ya?

300TB Windows Volume?

I need to build a 64-bit Windows 7 Ultimate machine with 300TB (yes, that's terabytes) of usable storage in a RAID 6 configuration. But I can't seem to get a straight answer as to whether this is even possible. The box is going to be used to store network video. Any help or pointers would be greatly appreciated. They do not want to use NAS or FTP.

—James DiPasquale

THE DOCTOR RESPONDS: While in theory a GPT volume can be formatted up to 18 exabytes, it looks like the Windows file system can "only" support drives up to 256TB at this time, per this MSDN article (http://bit.ly/MokU36). The Doc is also not quite sure if Windows is the best operating system for a large server project like this, but we guess it's up to your clients.

Keeping Drives Cool in a New Case

It is time to replace a PC that I built in 2006 or 2007. At the time, I reused an old case that I really liked, but which is now really showing its age. I went back and read "The Great 2013 Case Race" in your February 2013 issue. I was ready to order the Thermaltake New Soprano that got the top score. I like the door that opens to the right (Antec and Rosewill, are you listening?) and the HDD dock on the top. Then I looked at your pictures and checked out the manufacturer's web page and realized that the hard drives mount sideways in trays instead of the normal screw mount with the cables facing into the center of the case. That concerns me. How does one cool the hard drives when they are tray-mounted sideways in the case? It looks like the frame of the tray-mount brackets block air from a front-mounted fan, and there is no way to hang a cooler fan on the bottom of the drives. I give a lot of credit for the fact that my hard drives lasted six or seven years to the extra cooling that I used on the computer being replaced. Do the current production hard drives run a lot cooler than they did years ago so that extra cooling is not needed?

—Dave Marshall

THE DOCTOR RESPONDS: Times have changed since last time you bought a case, we guess. The New Soprano's drive-mounting trays and orientation are pretty much bog standard among ATX cases these days. The drive trays don't block all the air from the front intake fan. The air flows through them and then into the rest of the case in the normal fashion. Your drives will be fine with no extra cooling. In fact, some case manufacturers (well, Silverstone) claim that drives are best kept between 35 C and 43 C (86 F–110 F), based on a Google data center study from 2007 (http://bit.ly/9QTsx7) that found disk failure rates were highest between 25 C and 32 C. No matter what you believe, the Doc recommends that a proper backup system be put in place rather than planning on the HDD to not die. Most other case manufacturers, including Thermaltake, make sure to give their drive bays plenty of cooling anyway, though.

Cases like the Thermaltake New Soprano put the hard drives in easy-to-remove trays directly behind the front intake fan.

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Windows 8.1

The Skeptic's Guide to Windows 8.1

TO ALL THE WINDOWS 8 HATERS OUT THERE, WE FEEL YOUR PAIN! THE UPDATE MIGHT BE TOO LITTLE, TOO LATE FOR SOME, BUT IF YOU'RE READY TO ACCEPT A WIN 8.1 FATE, OUR GUIDE WILL GET YOU STARTED

THE MAXIMUM PC STAFF AND DAVID MURPHY

Sometimes we wonder if Microsoft didn't actually build a new OS so much as a Frankenstein that its customers could direct years of pent up anger, frustration, and fear onto. For example, just hint that Windows 8.0 ain't *that* bad on the Internet, and some Windows users will react as if you keyed their mint '64 Chevelle Malibu and kicked their dog with your steel-toed boot. To say you'll get a beat down of YouTube-able proportions is an understatement of people's rage at Windows 8.0 today.

It's this gale-force headwind that Microsoft is flying into with its first major update to the much-maligned OS, which some blame for the record declines in PC sales. Dubbed Windows 8.1, this point release promises to address some of the major concerns people have with Windows 8.0 and even reintroduce the familiar Start button. But does it? Can this simple point release calm the seething masses?

Maybe and maybe not. If anything, it might actually make some people even angrier. Windows 8.1 brings back the Start button, yes, but it turns out it wasn't just the Start button we wanted, but the Start Menu that came with it. The process to even get the update and who exactly gets it and the work-arounds isn't going to make too many friends, either. In the past, major updates could be downloaded and installed on all of your machines *en masse* with little effort. Not so this time. Just getting the update on Windows 8.0 requires following a flow chart and throwing chicken bones across the top of your chassis.

Yes, we know you're skeptical, distrustful, and even a little pissed off, but to find out the full skinny on what you need to do to get Windows 8.1 and whether it's even worth the hassle, and how to make the most of it should you decide to take the plunge, you'll need to read the whole story.

SkyDrive

Anger

People

Confusion

Shopping

Pain

INSTALLATION ISSUES

UPDATING TO WIN8.1: EASY FOR SOME, A REAL PITA FOR OTHERS

Windows 8.1 is no mere Service Pack. No, it's a whole tenth better than Windows 8.0, thus the point-release designation by Microsoft. Therein lies most of the problems with even getting Windows 8.1. People expect it to be as easy and painless as a Service Pack, but it ain't. For the vast majority of folks, it just works, but that's no consolation to those of us who hit snags. Here are the possible issues you could encounter. (Note: We highly recommended that you run a backup before you install the upgrade, as going back isn't always easy).

WHO QUALIFIES FOR THE UPGRADE?

Anyone who is currently running Windows 8.0 or the Windows 8.1 Preview is eligible for the upgrade. If you were waiting for the notification to pop up in Windows Update that Windows 8.1 is ready for download, stop. In its infinite wisdom, Microsoft has decided that despite intense hatred by many of the Modern interface, that's the only place you can get the Windows 8.1 update, in the Windows Store. Even more confusing, this won't work for everyone. Those running the Enterprise version of Windows 8 or Win8 Pro using a volume license, MSDN, MAK, or TechNet key will not be able to grab the update in this manner. Instead, Microsoft is recommending that those with VLK versions download the ISO from MSDN or TechNet and perform an in-place upgrade. Enterprise users are recommended to just talk to their sys admin about how to update. Not sure what you're running? Just hit Windows R and type **slmgr.vbs –dli** and Windows will identify your version.

NO 64-BIT FOR YOU!

Microsoft has included the requirement that the 64-bit version of Windows 8.1 support the CMPXCHG16b instruction. This won't cause problems for anyone with a modern CPU, but if you're using one of those earlier CPUs that had 64-bit support but not an explicit CMPXCHG16b instruction, you're screwed. According to formerly in-print PCWorld.com, the affected chips include Athlon 64 X2 parts, Opteron 185, and other "vintage" 64-bit processors. Sometimes, it's not even just the CPU, as reports indicate that the Core 2 Quad, which apparently supports the instruction, is stopped by the error because the P35 chipset doesn't support it. The "fix" is to run 32-bit, or not run the upgrade. There is also a reported work-around but it's no fun to execute and would take a page just to describe. Poo.

I DON'T SEE NO STINKIN' UPGRADE

Getting the upgrade should be simple, except it's not. First, as we said, you can only get it through the Windows Store from within the Modern UI. Second, well, sometimes it still won't show up. Why not? You need to have all of the previous updates installed first. You may also need to reset the Windows Store. You can do this by swiping in from the right, touching the magnifying glass icon, and... oh hell, forget that. Just start a command prompt by hitting Windows Key + R and typing **wsreset.exe**. Now reboot. Go back into the Store and the update should be displayed prominently. Still not getting it? It's possible that your Windows 8 is a version that doesn't qualify—meaning it's an Enterprise or Professional version using a product key from MSDN, TechNet, or a volume license. Unfortunately, your only answer may be an in-place upgrade (if you're lucky) or nuking from orbit.

The Windows 8.1 upgrade can only be found in the Windows Store, and only after all Win 8.0 updates are applied.

UPDATING FROM THE PREVIEW VERSION

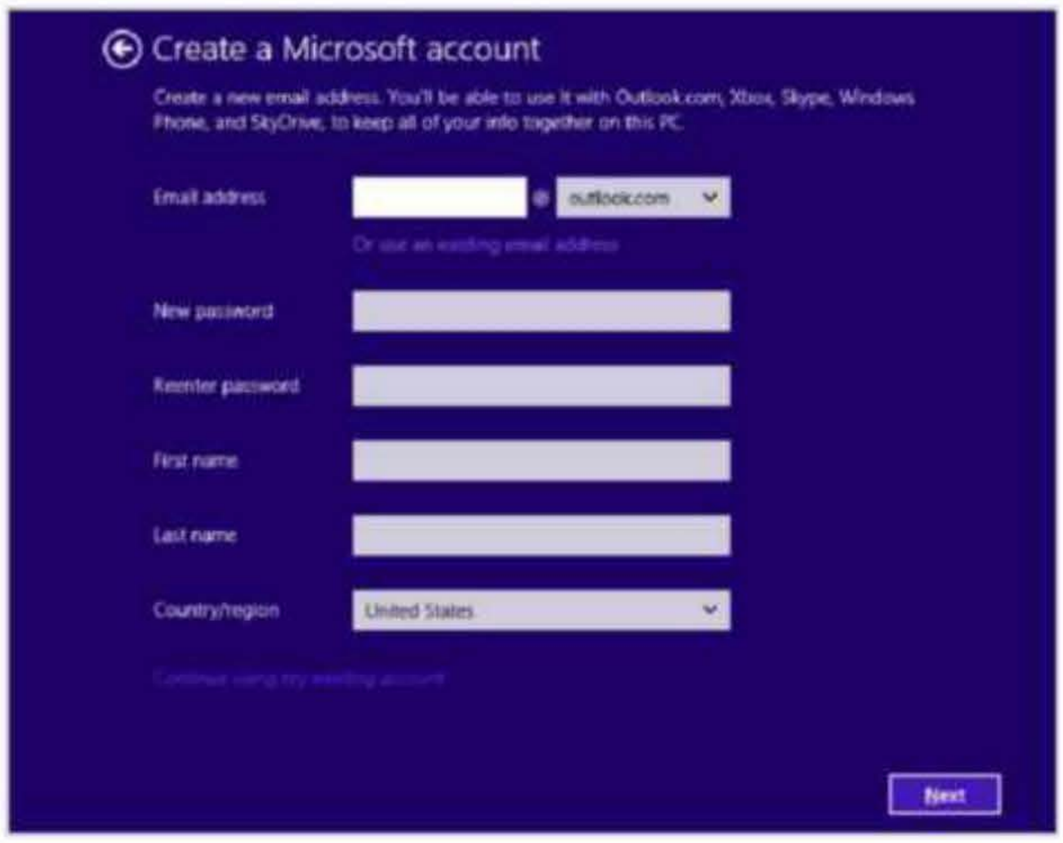
If you installed the preview version of Windows 8.1 and are still using it, your trial license is about to expire. After January 2014, you have to activate with a retail product key. You'll still need to download the final version of the OS, too. Thankfully, you can get that update from the Windows Store, just as if you were upgrading from a retail copy of Windows 8.0. The store is the green-and-white "shopping bag" icon on the Start screen, which you access by pressing the Windows key on your keyboard.

If you made a "clean install" of the preview version from ISO media, where you use a DVD or USB key to completely replace the current operating system instead of upgrading from it (or you installed onto a blank hard drive), you too can use the Windows Store to upgrade to version 8.1.

START MENUS AND MICROSOFT ACCOUNTS

Since Windows 8 no longer comes with a Start menu, a cottage industry has emerged to fill the gap. Windows 8.1 has a Start button, but no new functionality is present. Our third-party Start menu, Start Menu 8 (free, www.iobit.com), had no issues with our updating to Windows 8.1. Microsoft's new Start button just never appeared.

The trickier issue is Microsoft accounts. By default, Windows 8.1 does not invite you to create a standard local account during the installation phase, which stores your credentials on your computer like usual, rather than on Microsoft's server in the "cloud." Instead, the company wants you to sign into a pre-exist-


Create a Microsoft account
Create a new email address. You'll be able to use it with Outlook.com, Xbox, Skype, Windows Phone, and SkyDrive, to keep all of your info together on this PC.
Email address
outlook.com
Or use an existing email address
New password
Reenter password
First name
Last name
Country/region
United States
Next

Win 8.1 will prompt you to create a Microsoft account, but you can bypass that in favor of a local login.

ing account for services like Hotmail or Outlook.com, or create a new one inside this networked ecosystem. To get around this installation step, click Create Account instead of entering your Outlook.com or Hotmail login. Then, at the bottom of the next page, click "Continue using my existing account." If you are installing 8.1 from scratch, you will have the option to create a new local account instead.

An MS account isn't bad news or anything. It allows you to use SkyDrive to sync your apps and settings across different PCs. It will let you consolidate Facebook, Twitter, Outlook, and LinkedIn feeds into the People app. It makes Hotmail and Outlook.com integration smoother. And you need it to get and update apps from the App Store, anyway. (You don't have to worry about not being able to log in if you're offline, because Windows itself will "remember" the last correct password you entered.) You can also switch your PC from an MS account to a local account later on.

UPDATING MULTIPLE PCS TO 8.1

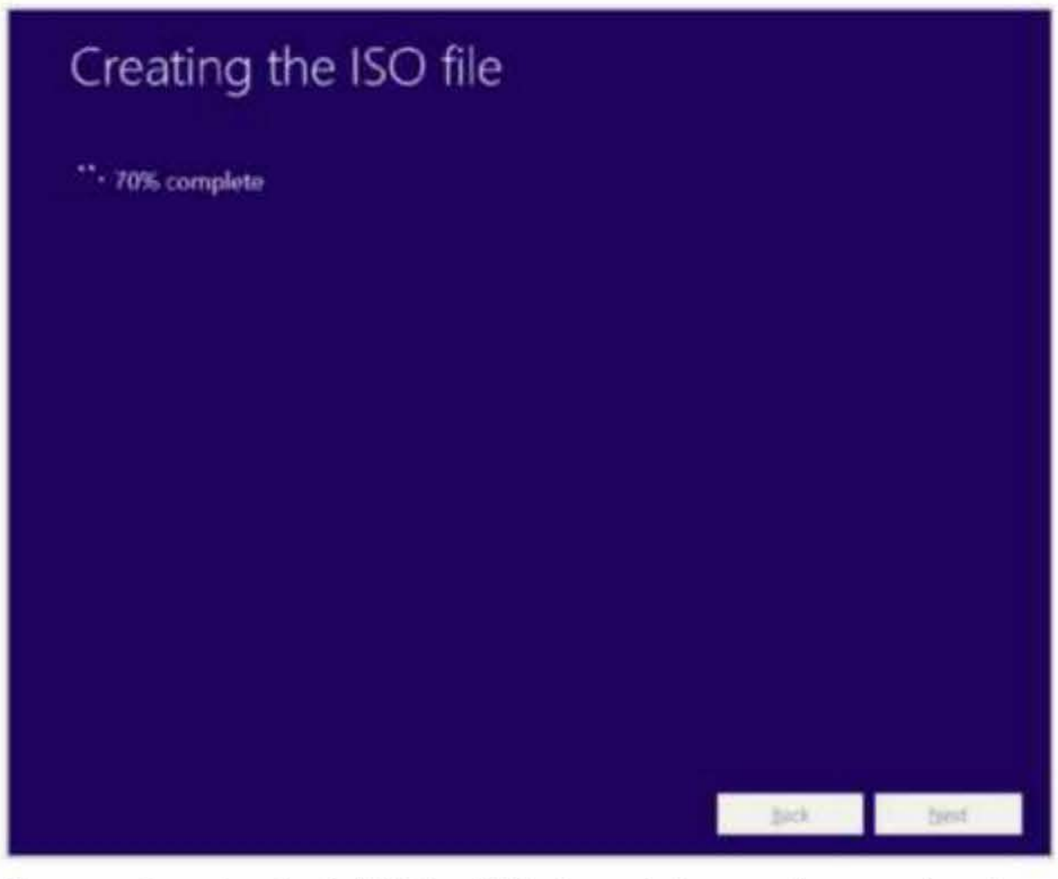
If you have a small business or a household with a bunch of Windows 8.0 machines, downloading the 8.1 update for each PC could take a lot of time and bandwidth, since each download is basically the entire OS. But we know a trick to convert this download into an ISO, which you can then put on a DVD or USB flash drive, so that you only need to download it once. Be advised, however, that this only apparently works if you are running a retail version of Windows 8.0—the downloader rejected the OEM keys we tried as well as the "generic keys" floating around the Internets.

Pick any of your Windows 8.0 PCs and navigate to this Microsoft site: http://bit.ly/SCANcl. Have your product key ready. Click the "Install Windows 8.1" button. Choose "Install by creating media," click Next, select ISO File, and click Next again. Choose the destination folder of the download, and click Next. The program will now download the Windows 8.1 update and create an ISO for it. Then it will ask if you want to burn the ISO to a DVD right now. You do have the option to create a bootable USB stick, but the general consensus is to just save the ISO instead, as you can always create a bootable USB stick version later on using the Windows 7 USB/DVD download tool: http://bit.ly/162L74X. Using this disc, you're still limited to an in-place upgrade only—not a service-pack-like upgrade.

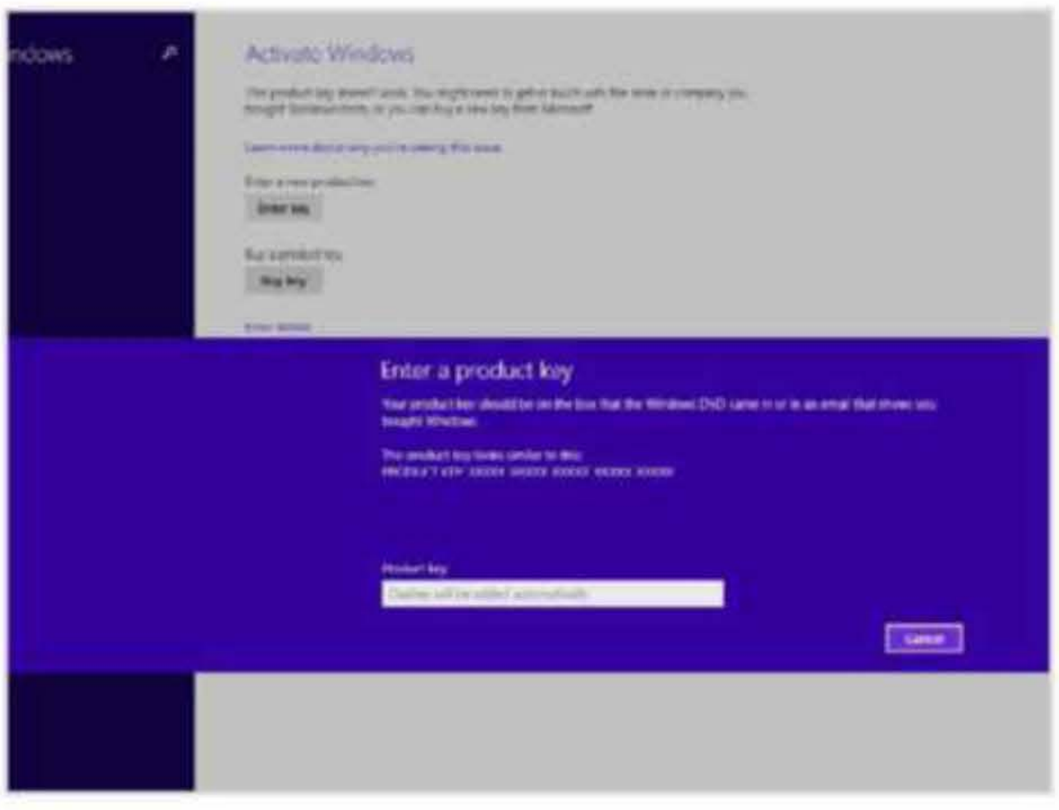
ACTIVATING A WINDOWS 8.1 ISO WITH AN 8.0 KEY

You may have been told that you can't install Windows 8.1 from scratch and use a Windows 8.0 key. However, you can use a "generic" key designed for testing. The "generic" keys we refer to are those floating around the Internets—if you Bing "generic Windows 8.1 key" it shouldn't take too long to find. Using the generic key, you will be able to eval Windows 8.1 for 120 days. Once you've entered in the correct generic key for your version of Windows (either Core or Pro) you can now activate it with your original, licensed Windows 8.0 key.

Once you've completed installation using one of these keys, open Windows Explorer (it's the folder icon in your taskbar), right-click This PC, select Properties, and click the link at the bottom-right that says Activate Windows. Then click the first Enter Key button and enter your Windows 8.0 retail key. Your copy of Windows 8.1 is now officially installed.



You can download a full ISO of Windows 8.1 to perform an in-place upgrade or even clean installs, sorta.



Windows 8.1 introduces a visual upgrade to the method for changing your product key.

CUSTOMIZATION

THE ESSENTIAL FIRST STEPS TO MAKING WIN 8.1 DESKTOP-WORTHY

Like candy? Then you'll love Windows 8.1, because the improvements Microsoft has made in its first major iterative update to the Windows 8 operating system include a ton of eye-candy tweaks that should make your experience within the operating system prettier, at least—and in some cases, a bit more user-friendly!

No, you still don't get a "real" Start button and, no, you can't ditch the Modern UI for good without a third-party program. We'll consider Microsoft's tweaks to be but baby steps on the grand evolution of its Windows 8 ecosystem, one that hopefully comes with even more happy desktop/Modern UI integration for those still displeased by the touch-themed tidbits of Microsoft's latest OS.

BOOT TO DESKTOP

One of the most frustrating elements of Windows 8 is its inability to boot directly to the classic Windows desktop, instead dumping users onto the Start screen with each and every flick of the power switch. Thankfully, Windows 8.1 gives you a bit more freedom in that regard.

To boot to Desktop mode instead of the Start screen, hit up your desktop, right-click your taskbar, and select Properties. Click the Navigation tab and select the option: "When I sign in or close all apps on a screen, go to the desktop instead of Start." How's that for a description?

SIMPLIFY YOUR LOGIN

Good for you; you have a strong password for your Microsoft Live account and you aren't afraid to use it. If you're the only one who ever has access to your desktop or laptop, however, maybe the act of typing in that 30-character passphrase is more trouble than it's worth. Let's simplify.

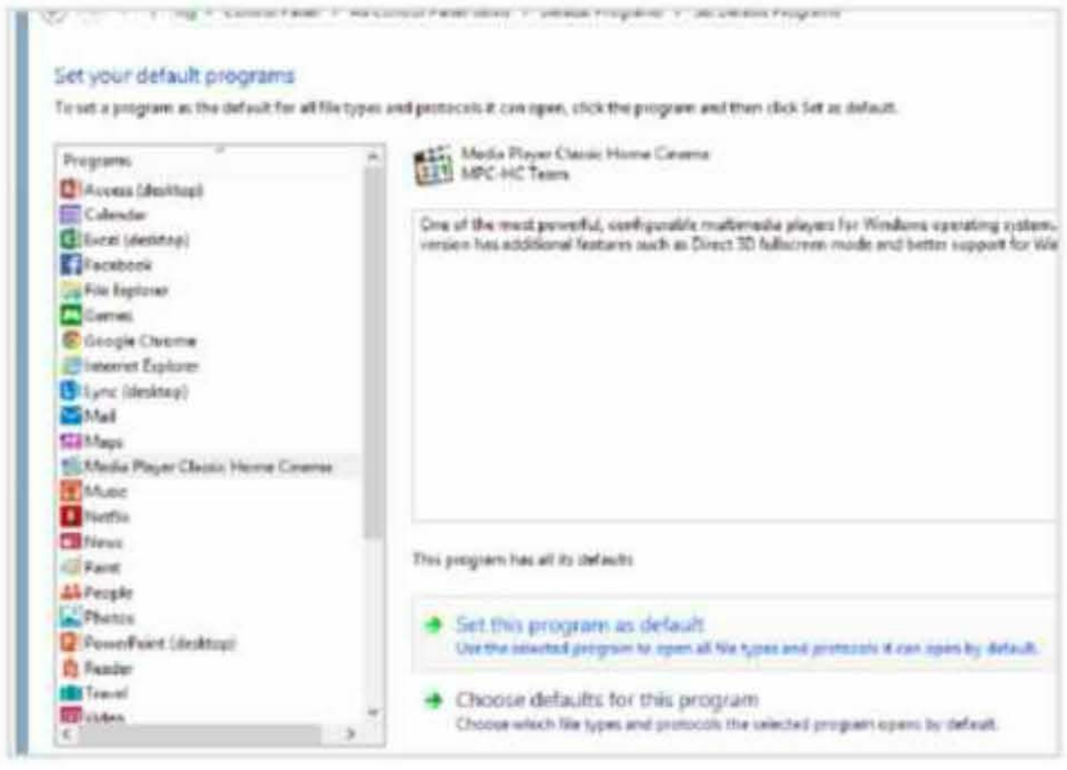
While Microsoft's picture passwords make more sense for tablet users, you can still have a bit of (secure) fun working your mouse-drawing skills.

Switch over to Windows 8.1's Modern UI, hover your mouse in the lower-right corner to reveal the Charms Bar, and click the Settings button. Click Change PC Settings on the bottom-right corner, click Accounts, and then click Sign-in Options. Set up a PIN, and you'll have a much easier time logging into your home system without compromising the integrity of your long Live password. Set up a picture password, and you'll get to have a bit of fun using taps, circle-gestures, and lines to serve as your system's new authentication method.

SET YOUR DEFAULTS

One of the first places we like to stop within Windows 8.1—after we've installed some of our favorite third-party apps such as Media Player Classic (or VLC) for our videos and Chrome for our webpages—is the operating system's list of default programs. That doesn't sound very sexy, we realize, but it's a key part of Windows 8.1 that allows you to exert an iron fist over how your operating system treats your files.

Fire up the Modern UI, type in **default**, and select the Default Programs option that appears within the sidebar search results. Click "Set your default programs," and then find an app in the left-hand portion of the window that appears that you want to be, well, the default app for all file types that it can open. Highlight it, click the "Set this program as default" option, and you'll never have to wonder why Windows Media Player is trying to load your jams instead of VLC.


Set your default programs
Programs
Media Player Classic Home Cinema
MPC-HC Team
This program has all its defaults
Set this program as default
Choose defaults for this program

We often find ourselves checking the Default Programs window from time to time, just in case something else has taken over our favorite app's file types.

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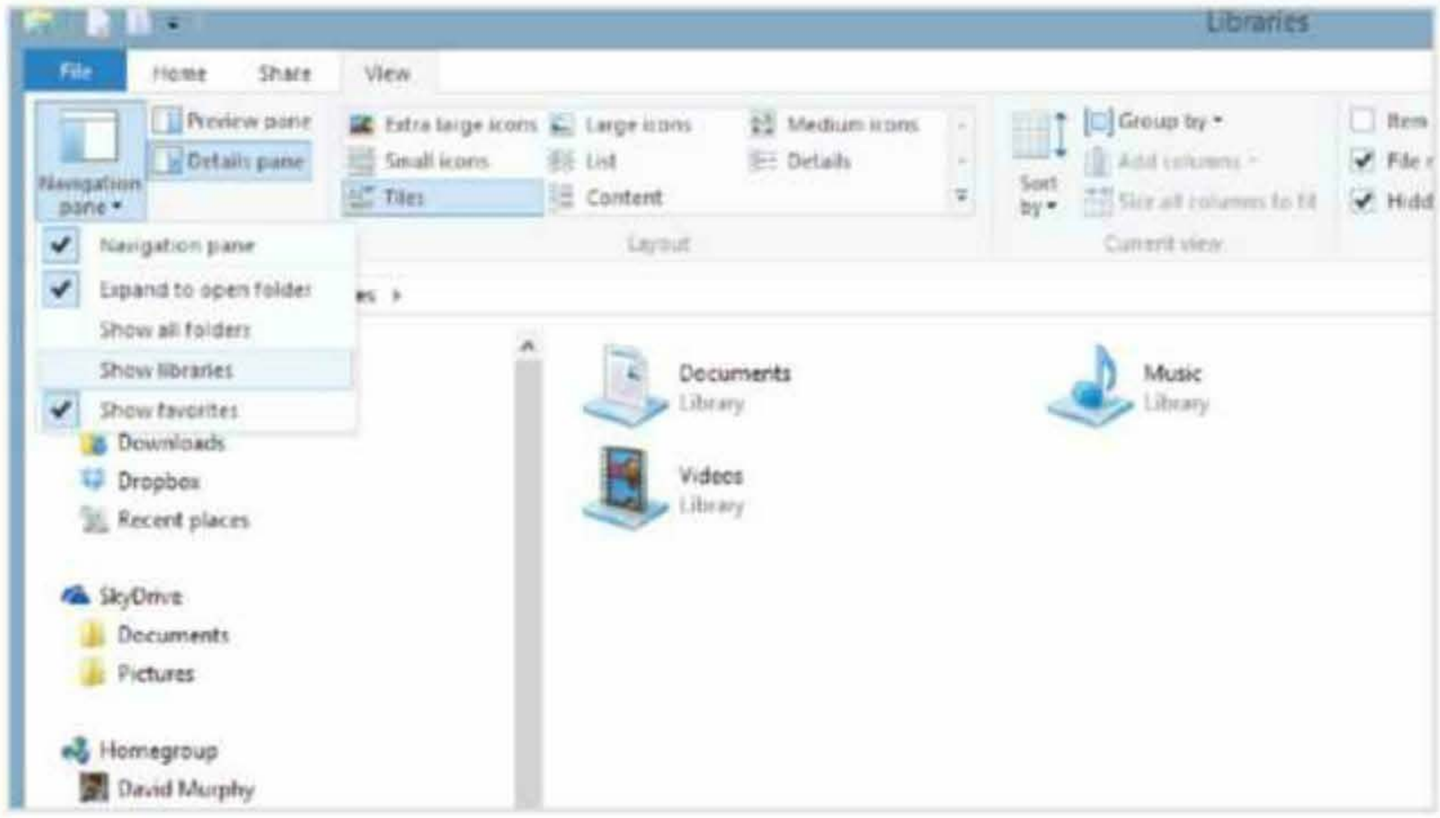

We were just as confused as you when we couldn't find our file libraries in Windows 8.1.

here's how you do it: Hit up Windows 8.1's desktop mode and right-click the taskbar, then select Properties, which will bring up the new "Taskbar and Navigation properties" window. On the very first tab that appears (Taskbar), you'll see a few options toward the very bottom.

Uncheck the "Show taskbar on all displays" to confine your taskbar to one display. If you'd rather be a bit more surgical about your taskbar, you can always select on which taskbar you'd prefer your running apps' buttons be located, depending on what screen they're active on. You can also globally set whether you want an app's multiple windows to combine into a single button, or exist as independent objects on each taskbar. (The "Taskbar buttons" setting controls your primary monitor; the "Buttons on other taskbars" controls your other monitors.)

UNIFY YOUR DESKTOP AND START SCREEN BACKGROUNDS

A new tweak in Windows 8.1 finally allows us to use a single desktop background for both the Modern UI and Windows 8.1's desktop mode. To unify these two seemingly disparate environments, right-click your taskbar on the Windows 8.1 desktop and select Properties. From there, click the Navigation tab. Select the option to "Show my desktop background on Start," and you'll now be able to look at the same, pretty picture regardless of whether you're clicking around the Modern UI or "classic" Windows desktop.

HOW TO DISABLE CHARMS (SORT OF) AND RECENT-APP SWITCHING

Tired of all those funky bits of Windows 8.1's Modern UI appearing unexpectedly, like when you accidentally mouse over one of the four corners of your display? We can fix that; we have the power. Fire up the Start screen, move your mouse over to the lower-right corner, click Settings, and then click Change PC Settings at the bottom. Select "PC and devices," and then "Corners and edges."

While you can't disable *everything* about the Modern UI, you can use the corresponding on/off switches to hide Windows 8.1's upper-left Recent Apps pull-out, in addition to the upper-right hotspot for the Charms Bar. You'll still be able to (or have to) access the Charms Bar via Windows 8.1's lower-right hotspot, but it's a start, right?

RESTORE YOUR LIBRARIES IN FILE EXPLORER

Once you've made the jump to Windows 8.1, you might notice that a certain part of File Explorer no longer exists—namely, easy access to your good-ol' Windows libraries, those helpful Documents, Music, Video, and Pictures links that gave you a quick and easy way to check out all of your writing and media.

Well, the libraries may be gone, but they're not gone for good. To bring them back into File Explorer, you just need to fire it up and click the View tab. From there, click the Navigation Pane button toward the upper-left of the window, and then select "Show libraries." This little buried setting might be tricky to find on your own, but it's worth the five-second trip.

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TILE MANAGEMENT

MAKING THE MOST OF MODERN UI

We're not 100 percent sold on the jarring changes that Microsoft has constructed between its tried-and-true Windows desktop and its newfangled touchscreen-themed experience. However, we have become a bit more accustomed to tiles since Windows 8's launch last October, and Windows 8.1 does offer some important improvements to make the Modern UI a bit more palatable—for those not already using third-party programs to write it off for good.

A BRAND-NEW START SCREEN

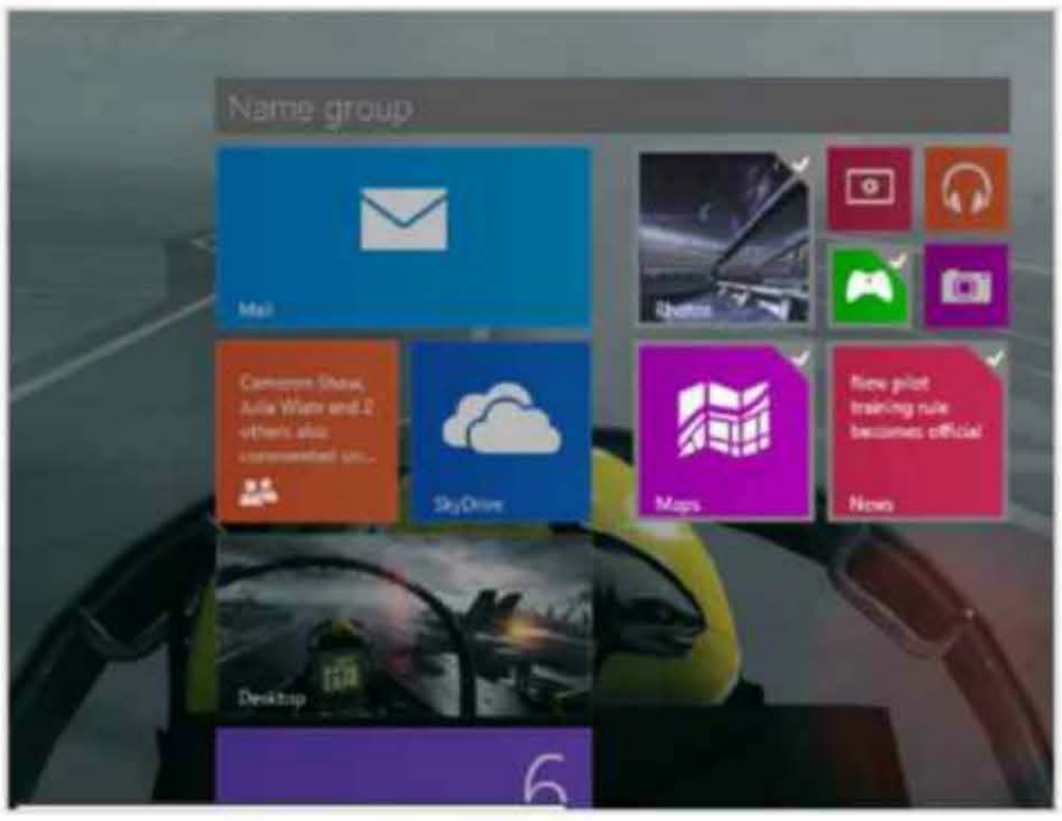
One of the most headache-inducing elements of Windows 8's Start screen was that Microsoft gave its users absolutely no way to contain the flood of shortcuts—now tiles—that would invariably litter the area after the installation of just a few applications.

Windows 8.1 reverses this treatment. Now, your Start screen is as bare as bare can be; you have to manually select apps that you want to see when you jump into the Modern UI. Tiles won't just appear by default on your Start screen whenever you install an application—yes, even a Windows Store app.

So, how do you get your favorite apps onto your Start screen? Pull up the Start screen and jiggle your mouse until an arrow icon appears in the lower-left corner. Click that to access the All Apps screen, and then right-click any of your tiles and select Pin to Start from the bar of options that appears at the bottom of the screen.

CONTROL THY TILES

It's a lot easier to go about modifying your tiles than it ever was on plain-ol' Windows 8. Here's what we mean: Pull up the Start screen and right-click a tile. Heck, right-click a few tiles—multiple-tile attribute editing has been beefed up in this new iteration of Microsoft's OS.



Goodbye, single-app-at-a-time uninstallations. Why Microsoft didn't slap this into Windows 8 by default, we'll never know.

Once you've done so, you'll see an option at the bottom of your screen for resizing tiles. Click that, and you'll be given one of four sizes to choose from, ranging from Small (1/4 a standard tile size) to Large (four tiles' worth of space). Selecting Medium gives you the default Windows 8.1 tile dimension, whereas Wide allows you take up two tiles' worth of space by one tile's height. While you're there, you can also use the "Turn Live Tile Off" option to do just that—transforming your Windows 8.1 tiles into static representations of shortcuts rather than little boxes that are otherwise updated with news based on whatever the tile happens to be (assuming the tile supports the feature).

You can also more easily remove apps (as in, Windows Apps, not applications) from your system—uninstalling multiple apps at once—by right-clicking each one you want gone on the Start screen and selecting the Uninstall option. Once you do so, you'll be asked to pick whether you want to simply nuke them from the system you're currently using, or whether you want to remove the apps from all the systems whose settings have been synchronized to your Microsoft Live account. To note: This only really works well with apps, as mentioned; trying to uninstall apps and applications simultaneously gives preference to the former over the latter.

And, of course, moving and grouping tiles is easier in Windows 8.1, as well. Select your tiles and drag them to a new, empty column (you'll know you've nailed it once Windows displays a giant, translucent gray bar), and then type in a name for your new chunk of shortcuts in the Name Group field. It's as easy as that!

MASTER THE NEW 'VIEW'

This might win over you Modern UI haters: Windows 8.1 brings some new improvements to its Snap treatment of Modern apps. Depending on the size and/or number of monitors you're rocking, you can have up to eight different Windows apps running and visible at once.

Ready? Fire up a Windows app within the Modern UI, move your mouse to the top of the screen until your cursor changes into a hand, and then click and drag the entire app toward the far left or far right of your monitor. You'll now see some empty gray space on the other side. Left-click anywhere within that to launch a new app, side-by-side, in the empty space.

Now that you have your screen split into two, if you want to go for the big three (and your screen allows it), launch an app from the Start screen on the monitor that your two split apps are running on. When you do, the app itself will appear to float in the center of your screen for a bit. Click it, hold down your mouse button, and keep it hovering over the center divider. Voilà—your Modern UI will magically make room for more.

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SKYDRIVE MASTERY

MORE ROBUST OPTIONS MAKE WIN8.1'S CLOUD STORAGE A COMPELLING OPTION

Microsoft seems a little more ready to tackle the cloud storage world with its SkyDrive service, now that the 7GB of free cloud storage comes more baked into Windows 8.1 than it did with Windows 8.

And this is more than Microsoft just dropping a shortcut to SkyDrive within File Explorer and calling it a day. A number of nifty features work behind the scenes to ensure you aren't sucking down massive amounts of data that you might not necessarily need (or worse, filling up a limited hard drive with a ton of unnecessary SkyDrive content). Your SkyDrive folder will be accessible and searchable just like any other folder on your physical hard drive. However, only when you go to access a file will Microsoft pull it down from the cloud.

And yes, you can still manually select to synchronize as many files and folders as you want if you're more into the Dropbox "sync everything" method. That said, onto the tips!

VIEW/ADD SKYDRIVE STORAGE

If you're concerned about how much space you might be eating up of your 7GB of free SkyDrive storage—or want to add more—Microsoft's made it easy for you to check and/or buy. Fire up the Start screen, pull open the Charms Bar, and click Settings. Click Change PC Settings, and then select the SkyDrive option. The very first screen you then see will tell you how much storage you're using, in total, and give you the option to purchase more if you're so inclined.

SAVING YOUR STUFF

A nifty new feature in Windows 8.1 is the ability to have supported apps prompt you with the option to save your files to the cloud instead of your local hard drive. The best and easiest example of this is Microsoft Word. Enable the option, and you'll always first be given the chance to stick your files in your SkyDrive documents folder, a real time-saver if you're a SkyDrive aficionado. To turn on this option, just flick the little switch below the SkyDrive storage information that we previously mentioned. You can't miss it, as it's labeled "Save documents to SkyDrive by default."

AUTOMATICALLY UPLOAD TO SKYDRIVE

If you're the kind of person who wants to make sure that everything you're doing on your smartphone or camera, for example, is automatically saved to the cloud, Windows 8.1 makes it easy. Under the Camera Roll menu within the aforementioned SkyDrive settings screen, you'll find options that allow to you manage the size at which your pictures are automatically stored in the cloud. Additionally, you'll see the ever-important switch that will allow your system to automatically send videos up to SkyDrive as well.

SYNC YOUR SETTINGS

One of the fancier features of SkyDrive is its ability to synchronize a bevy of your personal settings for Windows 8.1; log into a fresh Windows 8.1 machine with your account, and it'll look just like what you're used to using.

You can, of course, flip this option on and off within the Sync Settings menu on the SkyDrive settings screen. More importantly, you can choose what you want SkyDrive to sync: your tiles? Your desktop theme? Your app settings? Passwords? The choice is yours.

MAKE SEARCH WORK FOR YOU

Turn off Bing As you've no doubt noticed, Microsoft's made a few changes to Windows 8.1's search functionality. Start typing on the Start screen and you'll find that your system automatically starts searching through, well, everything: Windows settings, your files, and—*guess who?*—Bing!

If you're not keen on marrying your offline searching with an ever-present web search, here's how to ditch it. Fire up the Charms Bar, click Settings, click Change PC Settings, and select "Search and apps." From there, ditching Bing is as easy as flicking off the switch for "Get search suggestions and web results from Bing."

Hide Your Files Perhaps there are some things you *don't* want to automatically populate the default "Everything" search within Windows 8.1. We're not going to venture to guess what those files actually are—we're just going to tell you how to make them invisible to Windows 8.1's watchful eye.

If you have data on your hard drive that you don't want Windows 8.1's Modern UI-based search to find, simply go to the files or folders within File Explorer, right-click, select Properties, and tick the little checkbox for the Hidden property. If File Explorer isn't set to view hidden files, your folder or file will vanish from view. To get it back, just check Hidden Items in the View pane of File Explorer. Since they won't show up in search, you'll need to remember just where you hid your precious collection of vintage Seka movies.

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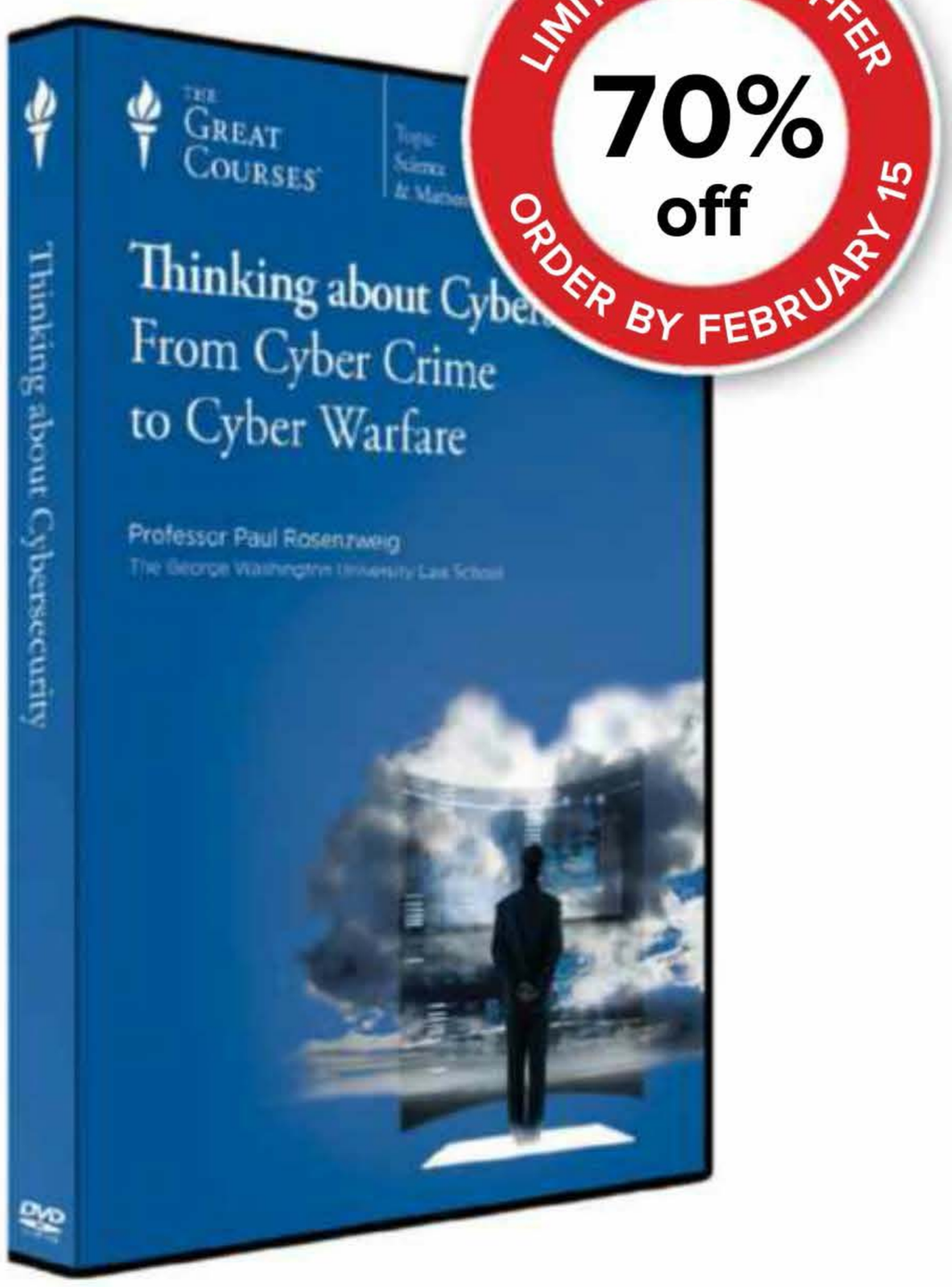

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WINDOWS 8.1 REVIEW

ANOTHER YEAR IN THE OVEN MAKES FOR A TASTY PIECE OF MEAT

Just by virtue of the fact that Windows 8.1 is an *update*, we can assume it's an improvement over its lukewarmly received predecessor—which was in dire need of a boost in public perception. Of course, Windows 8.1 remains true to the mission of combining a desktop and mobile OS—so if that's been your biggest beef, you won't be appeased. But desktop users who are willing to look past the Modern interface will find that Windows 8.1 offers some welcome enhancements to the operating system, along with a few nagging tidbits that make us look forward to the next update.

WINDOWS 8.1 USER INTERFACE

Let's start with the biggie: the Start button. A variant of the Start button from operating systems of yesteryear makes its return in Windows 8.1, but really, it's only a cheap facade.

Windows 8.1's "Start button," shows up on the OS's desktop mode, but it does not present one with a delightfully simple pop-up menu of one's apps. No, it merely takes you to Windows 8.1's Start screen (aka the Modern UI). Ta-da.

You *can* have the Start button automatically pull up Windows 8.1's "All Apps" menu via a setting in the Taskbar and Navigation properties, which is kind of like the illegitimate child of the Start screen and the Start Menu. Still, a conventional Start Menu, the All Apps view ain't.

On the plus side, Microsoft *has* boosted the number of options found in Windows 8.1's right-click context menu. Power users will surely appreciate the additional tweaks, including—finally—a means of shutting down your computer from the desktop (if Alt+F4 isn't your thing).

Jumping over to the Start screen for a minute, we love that Microsoft has cleaned up the look and feel of the tiles. For starters, Windows 8.1—unlike its predecessor—doesn't just slap every single "shortcut" that an application creates upon installation as a new tile on the Start screen. That which you install gets kicked over to the All Apps view by default, leaving your Start screen pure and pristine. Only the programs that you specifically pin get placed there—and that includes apps you grab from the Windows Store.

Microsoft also brings a few tweaks to tiles themselves. You can now uninstall everything that Microsoft's dumped onto your Start screen *en masse* by right-clicking and group-selecting/uninstalling that which you don't want. For the tiles you want to keep, you can now select between one of four different sizes for each (or change a batch at once)—Weather, for example, will expand to take up four normal tiles' worth of space and dump plenty of information about the forecast right on the front of your Start screen.

We also like how Microsoft has enhanced the various customizations one can do to the Start screen.

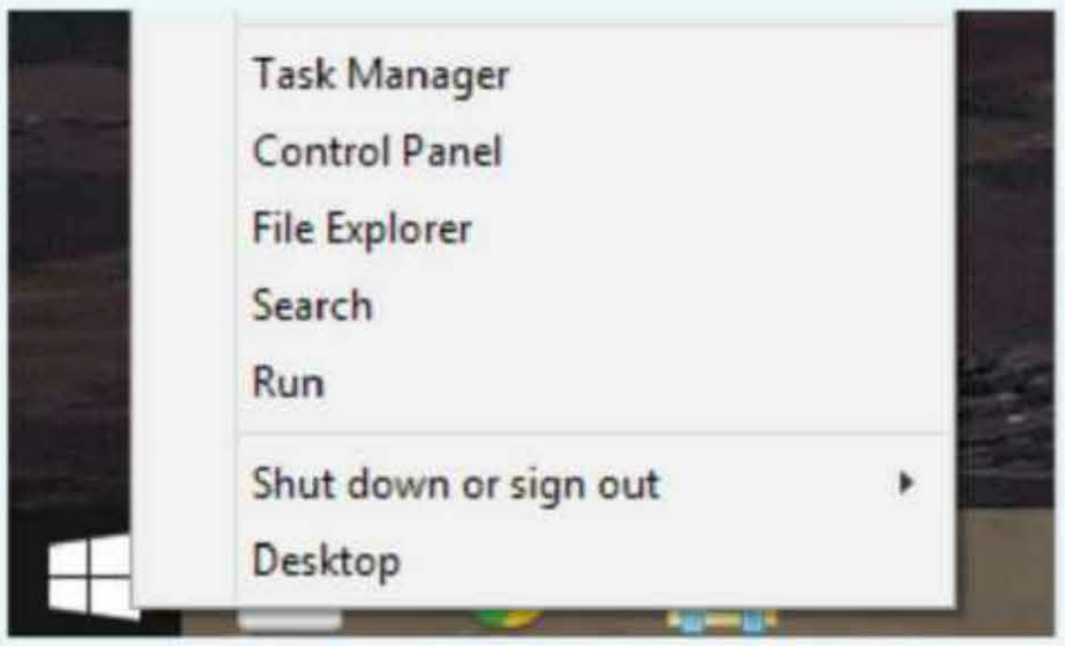
For the photo-maniacal, Windows 8.1 now lets you set up slideshows on your lock screen if you don't like looking at the same ol', same ol' whenever you boot into Windows 8.1. Heck, you can even "boot" into your system's webcam (or included camera) from the lock screen itself. This desktop OS is starting to look more and more mobile by the minute....

Windows 8.1 also gives the lackluster Modern-based PC Settings menu of its predecessor a much-needed kick in the pants. Take, for example, the new option that allows you to turn Hot Corners on and off (without having to resort to third-party freeware), the specific controls regarding Windows 8.1's new search techniques (we'll get to that), and the brand-new SkyDrive options you can access from Modern by default (also fodder for later).

We still wish that all of your system's settings were unified regardless of where you go to edit them—the Start screen or the desktop's Control Panel.

WINDOWS 8.1 SEARCH

One of the major "improvements" Microsoft has made to Windows 8.1 includes a complete reworking of the operating system's core search functionality. Before, it was a bit of a convoluted mess—you'd start typing in Modern and, once you entered a good enough selection of letters to describe what you were looking for, you'd have to select what, exactly, you were trying to find: an app? A system setting? File? Some kind of data within an individual Windows 8 app?



We would argue that the right-click functionality of the Start button is more useful than the left.

Too much clicking. Yuck.

Microsoft goes a bit to the other extreme, however, in Windows 8.1. Now, when you start typing in the operating system's Start screen, you get a default search of *everything* on your hard drive, period. That includes files, Windows settings and options, and as a special bonus, an ever-present web search courtesy of Windows 8.1's integration with Microsoft's Bing search engine.

We appreciate the gesture, but not every time we type in "Diablo" are we keen on seeing a web search related to the Lord of Terror. Sure, you can flick off the web-based search option within Windows 8.1's aforementioned preferences. But sometimes we do like having a web search attached to our search. Damned if you do, damned if you don't.

All in all, we like the new search if for nothing else than the reduction to the number of clicks a user must perform when trying to find something. The trade-off, however, is that you can no longer search through the specific parts of apps by default—for example, you aren't able to search through your email by simply typing on the Start screen. You now have to load the Mail application and perform

a specific search within that in order to find, say, an Amazon receipt.

Close, but not quite, Microsoft.

WINDOWS 8.1 SKYDRIVE INTEGRATION

We confess, we aren't big users of Microsoft's cloud service, but we do appreciate the SkyDrive integration in Windows 8.1. The cloud storage is now accessible via File Explorer (once you've attached your account to the operating system, that is). Like Dropbox, dragging-and-dropping things between SkyDrive and your local desktop is quite simple—the same kind of convenience you might have enjoyed had you, say, installed the SkyDrive desktop app on Windows 8.

That said, SkyDrive isn't *quite* like Dropbox. Microsoft has ingeniously built a fun little twist on synchronization into SkyDrive, whereby files are only loaded to your desktop—assuming you have an online connection to the net—when you want them. Sure, you get the icon and file details to suggest that the file itself is actually there every time you go to click it. Only, it isn't. Not unless you've set it, or its containing folder, to always be available to your system if/when your system's offline.

Desktop users might not care much about disk space or bandwidth, but we definitely see the usefulness for those using SkyDrive access on, say, a laptop or tablet. Assuming that you don't have a ton

Take that, apps-that-come-with-Windows-8.1. Mass-uninstalling apps is super-easy in the new operating system update.

of stuff that will quickly fill up SkyDrive's 7GB of free space per user, you can even set the OS to save your documents, photos, and files to the cloud by default.

As much as we like SkyDrive's closer integration with the OS—including all those fun settings you can synchronize to your Microsoft Account, should you wish to tap into your version of the OS on another piece of hardware—there are still annoyances. One, the SkyDrive Modern app remains a pain for non-touch-friendly users.

Second, Microsoft's tighter integration of SkyDrive costs you one of its more useful features—Fetch, or the ability that users previously had to tap into the full drive architecture of their SkyDrive-connected systems to grab any file on the desktop they wanted. It was akin to a having a permanent network tunnel to one's connected systems, and one that was as ideal for grabbing files as Google's Remote Desktop app is for controlling one's system from afar. Alas, Microsoft kills off this helpful feature in Windows 8.1. You can still use a Windows 8.1 system to grab files from a non-Windows 8.1 PC, but Windows 8.1 systems cannot have their files grabbed.

WINDOWS 8.1'S NEW WINDOWS STORE

While Apple and Google still win the day with the usefulness of their respective app stores, Microsoft has at least put noticeable effort into making its store more practical, more browse-able, and just all-around more user-friendly.

Loading the Modern app brings up the same ol' familiar (and horribly horizontal-scrolling) interface one should be used to by now. However, Microsoft puts its app recommendations front-and-center, in addition to lists of trending apps, new apps, and the much-anticipated listing of top apps by price (free or paid). That's much, much better than the crappy, categorical scrolling of Windows 8.

Even better, right-clicking anywhere within the Windows Store app presents a topmost bar bearing the aforementioned categories, should you wish to peruse specific type of apps. Each category gets its own trending, new, and top free/paid listing. Kudos to Microsoft for the changes—now how about getting to work on offering some popular apps? (Instagram, anyone?)

OVERALL WINDOWS 8.1 IMPRESSIONS

At the end of the day, we can't help but feel as though we're sitting in a barrel on the edge of a waterfall—that Microsoft is but one, tiny push away from giving users everything they've asked for (namely, a more explicit desktop/mobile split). We're so close already—even that new little Start button in Windows 8.1, while somewhat pitiful, is a ray of hope.

We're being a bit overdramatic, of course, as we generally appreciate all the tweaks that Microsoft has brought to the table in Windows 8.1. While they mainly center on personalization, customization, and one's core experience with the operating system, the updated search features and SkyDrive integration—for those who use it—are welcome additions.

Modern-based system settings are less of a pain in the butt (but could be further improved), and some of the other tweaks are still only really applicable to hardcore finger-tappers, like Microsoft's improved split-screen treatment for its Modern apps.

If you're running Windows 8, you really don't have much of a reason *not* to upgrade. If you're still a Windows 7 user stuck on the fence, it's a little trickier.

Windows 8.1 is certainly more compelling of an experience than the now seemingly forgotten Windows 8. However, you're still going to face off against a tablet experience packed into a desktop operating system. Modern apps, while improved, will still lack the power-user conventions (and speed) of their desktop-based counterparts. For desktop users, your standard monitor will be of little use for Windows 8.1's touchscreen-themed tweaks. You'll wonder why your system's settings are split between two different environments. The list goes on.

Should you give Windows 8.1 a go? Given that it doesn't look like Microsoft is going to give us a 100 percent desktop-centric Windows moving forward, you're going to have to take the new OS plunge sometime; Windows 8.1 makes the water just a little bit warmer.

–DAVID MURPHY

VERDICT 8

Windows 8.1

WARP 9.975 Plenty of personalization tweaks; better search; better SkyDrive integration; improved core apps.

WARP 10 Two UIs still feel disjointed; weak Start button; loss of some SkyDrive features; no search engine customizability.

$120, $200 Pro, free upgrade options, www.microsoftstore.com

CONQUER THE WORLD, FOR FREE!

DEEP STRATEGY THAT DOESN'T REQUIRE DEEP POCKETS

Some of history's greatest conquerors have been foiled by a lack of supplies, caused by broken supply chains, unrest at home, or fighting on too many fronts at once. War is expensive in the real world, and a lack of funds is the quickest way to ensure defeat.

That's not the case in these exciting new free-to-play games from Ubisoft, though. Anyone can join in, compete, and conquer their foes without paying a cent. Here, quick thinking and well-devised strategy reign supreme.

THE MIGHTY QUEST FOR EPIC LOOT™

STORM RIVAL CASTLES FOR LOOT, THEN DESIGN YOUR OWN TO SAFEGUARD THE SPOILS OF WAR

"I call this my gauntlet of doom," the Knight casually mentions as he strolls, untouched, through a meat-grinder tunnel of swinging axes, whirling razor-tipped wheels, and giant spikes erupting from the ground.

From the first moments of the opening cinematic-which has the cocky Knight, Sir Painhammer, showing off the awesome defenses he's built into his castle—I loved The Mighty Quest for Epic Loot's charming sense of humor. All four playable characters have a unique and fun personality: the cocky knight, the surly archer, the evil mage, and the rock-star runaway.

Each also has a unique playstyle, with diverse options to let you fight with whatever weapon, at whatever range you prefer. (I personally lean towards the run-and-gun tactics of the archer, Blackeye Bogart, but the Knight's hilariously boisterous personality is slowly winning me over.)

STORM THE GATES

You can use all four, swapping between them whenever you want, and you're going to, since the threat you face in every castle you storm will be different. Oh, did I forget to mention that you're going to storm loot-laden castles stuffed with deadly traps and monsters designed to keep you away from their treasure chambers? That's the best part!

When raiding a castle, the game plays like an action-RPG: your hero has a basic attack and four slots for powerful abilities or spells, pulled from a deep talent tree system that evolves as you level up. Run through the castle, bashing baddies and evading traps to the best of your ability as fast as you can. If you locate and breach the castle's treasure chamber fast enough, you can steal the loot.

It won't be easy. The best treasures await inside the keeps of other players, who've intricately designed every tiny nook, cranny, and fire-erupting rotating cannon in their place to ensure you'd die a hundred deaths before you laid a greedy finger on their hard-earned treasure.

The Mage nukes shambling zombies from afar.

The more enemies, the better-at least for The Knight.

The brawl isn't over until the rock concert begins!

The constantly changing layouts, threats, and designs keep the ARPG-style siege gameplay feeling fresh. Every drawbridge lowered launches you into a completely unique and hand-crafted map. Even when I fell just short of the treasure room, I had a blast–and knew the layout a little bit better for my next attempt. It's a glorious, empowering system that ensures there's always something new to play.

BUILT TO LAST

That's in large thanks to the fact that the possibilities for customization and player creativity in castle-building mode are incredible. Check out an example layout to the right, and let your mind start racing with how you're build your own. Want spring-loaded traps that fling the would-be thief into a deadly position? Done. Want chattering ghouls still shackled inside stockade blocks to unnerve their psyche? Can do. Want giant acid-spitting monsters hiding behind a huge whirling hamster wheel of metal and death? I know you do.

The castle-building portion of the game plays more like a traditional strategy or tower-defense game, where you get a top-down view of the entire keep, and can move and position your troops and traps as you see fit. You can spend hours fiddling with the layout and adjusting the positions of your deadly denizens. Trust me—I did.

START SIMPLE, GROW QUICKLY

The starting castle is nothing to brag to your friends about: a simple rectangle layout with a few rooms that can hold some minor traps. But, as you'd expect, these are just the basic building blocks. In no time at all, we'll turn that drab, stony corridor into a maze of all manner of grisly murders.

Some of the largest castles I've seen are mind-bogglingly impressive, hosting lengthy adventure sessions through their sprawling corridors broken into multiple sections, each with different traps and enemy combinations to keep the challenge varied and exciting. Someday I'll have a castle like that!

"THE LARGEST CASTLES ARE MIND-BOGGLING IMPRESSIVE, HOSTING LENGTHY ADVENTURE SESSIONS THROUGH SPRAWLING CORRIDORS"

In construction mode, castle rooms are easily picked up, dragged around like LEGO pieces, and latched onto other rooms at will. Each can be stuffed with collected minions, ranging from goofy to dastardly to downright brutal. You can even tweak the abilities and AI on some to change how they play.

There's plenty of room for fun combinations, like a cyclops that knocks back enemies surrounded by spike traps. Good luck getting by that guy unscathed, thieving jerks.

Boss minions, like a gigantic, acid-spitting toad, are rarer, but pack a hefty punch and are great stoppers at key chokepoints.

AN EPIC FUTURE

The combination of strategy-game castle construction and ARPG castle raiding is completely addictive, and swapping between the two modes is painless. On top of that, the list of maps to fight through is, in theory, never-ending and ever-changing as new players join and build their own unique castles.

The brilliant minds at Ubisoft Montreal have put together some amazing games over the years. They established themselves with the brilliant Tom Clancy's Splinter Cell back in 2002, continued to show strength through long-standing series like Assassin Creed and Far Cry, and show tremendous promise for the future with games like Watch Dogs and The Mighty Quest for Epic Loot.

You can start building your own castle, and smashing others' in The Mighty Quest for Epic Loot right now. Get early access to the beta plus 3 XP boosts worth $10 by using the code at the end of this feature!

THE KNIGHT
Name: Sir Painhammer
Occupation: Celebrity Sports Personality
Attack type: Melee
Favorite weapon: Huge Greatsword
Gets his good looks from: Mom

THE ARCHER
Name: Blackeye Bowgart
Occupation: Scary Thief
Favorite weapon: Crossbow
Attack type: Ranged
Demeanor: Surly

THE MAGE
Name: The Earl of Evilosity
Occupation: Evil Mage
Attack type: Ranged
Favorite cake: Devil's Food
Favorite type of domination: World
Beard status: Living

THE RUNWAY
Name: The Runaway
Occupation: Aspiring musician
Attack type: Mid Range Melee
Born to: Rock
Favorite salutation: Devil Horns

ANNO ONLINE

WAYS TO GROW YOUR EMPIRE

HOW TO BUILD A LASTING KINGDOM IN THE DEEP STRATEGY GAME ANNO ONLINE

For fifteen years, PC gamers have been building empires, sustaining trade routes, and managing complex economies in the Anno series, starting with Anno 1602 in 1998. The latest installment in our epic journey through city-building and management fully explores the online arena, where players can interact with each other, and help—or exploit—each other's settlements in their quest for glory.

There are hundreds of different tactics you can pursue, but these are three big keys to success you'd do well to keep in mind as you map out your strategy.

TRADE WITH THY NEIGHBOR

You're on an island, but only in the literal sense—your booming nation is surrounded by the fledgling civilizations of other players, who likely have resources you need to grow. Of course, you'll need to offer them something worthwhile in return, but true masters of diplomacy and networking will be able to find the desperate buyers and get more in return for the good their offering.

Take your time and find the right buyer you can exploit for good trade values. You can watch each trade happen as ships travel between your two island nations, to ensure they aren't trying to pull a fast one on you.

JOIN A GUILD

If you trade fairly and honestly with your neighbors, you should have no problem making a few friends who'll be interested in joining your guild. And, if not, you can always buy their loyalty with leftovers from your overflowing coffers.

Building a Guild Hall in your kingdom allows you to start your own guild and participate in all of the guild activities, like unlocking additional member slots. Joining up with allies will net you valuable key allies that are invested in your success, and willing to help you out in your time of need.

Plus, the building looks absolutely awesome, which gives your town some serious style points.

DIVERSIFY YOUR NAVY

Boats aren't oversized stretchy pants—one size does not fit all! You're going to want an armada composed of many types of unique ships, each custom-built to tackle certain types of tasks.

Need to find a new trade partner, or an empty island to expand onto? Send out the Discovery Ship, whose crow's nest makes it ideal for exploration. When silk fever hits your populace and everyone demands the finest linens from across the globe, you better upgrade your Oriental Ship's sails and cargo hold and send it buzzing over to the nearest silk trader.

Collecting the many different types of ships and upgrading or customizing their individual parts is a key part of the game that'll guarantee you're one step ahead of the competition.

MIGHT & MAGIC
DUEL OF CHAMPIONS
THE ONLINE CARD GAME

RAISE YOUR ARMY, ONE CARD AT A TIME

BUILDING A DECK TO CONQUER THE WORLD IN DUEL OF CHAMPIONS

Duel of Champions is an epic free-to-play card game set in the Might and Magic universe that puts a twist on the booming card-game genre with its 16-position board. Each player has their own 2x4 grid to position troops on, with room for universal effects to hover around the edges of the battlefield.

It adds a whole new level of strategic depth. Your work isn't done when you play a card—how you move it around the battlefield, and bring in reinforcements around it, can make the difference between victory and defeat.

GET WHAT YOU WANT

Veteran card gamers know the frustration of coveting a particular card that eludes you in every pack opening. DoC has come up with a brilliant solution: The Altar of Wishes.

It's a simple concept, designed to add a reliable route to receiving the card of your dreams. Every card pack you open has a chance to include Wildcards, which you can trade in at the Altar of Wishes for specific cards.

It's not a free-for-all, though. The Altar only has a small subset of DoC's 250+ cards initially. You unlock additional sets within the Altar via a series of achievements. Wildcards can also be earned in the game by winning tournaments, participating in community events, and completing achievements.

It's a brilliant system that helps new players catch up quickly and build powerful decks that can compete against anyone, while giving veterans a fool-proof way to track down that one card that's evaded them for years.

CARD TRICKS

THERE ARE HUNDREDS OF AWESOME CARDS IN DOC, BUT THESE ARE SOME OF OUR FAVORITES.

PAO DEATHSEEKER

Pao Deathseeker is as suicidal and murderous as his name sounds. He only has one turn to rush at something and bash it in the face for three damage before it disappears forever. It works great when there's an open lane to a low-health enemy hero.

VOID ARBITER

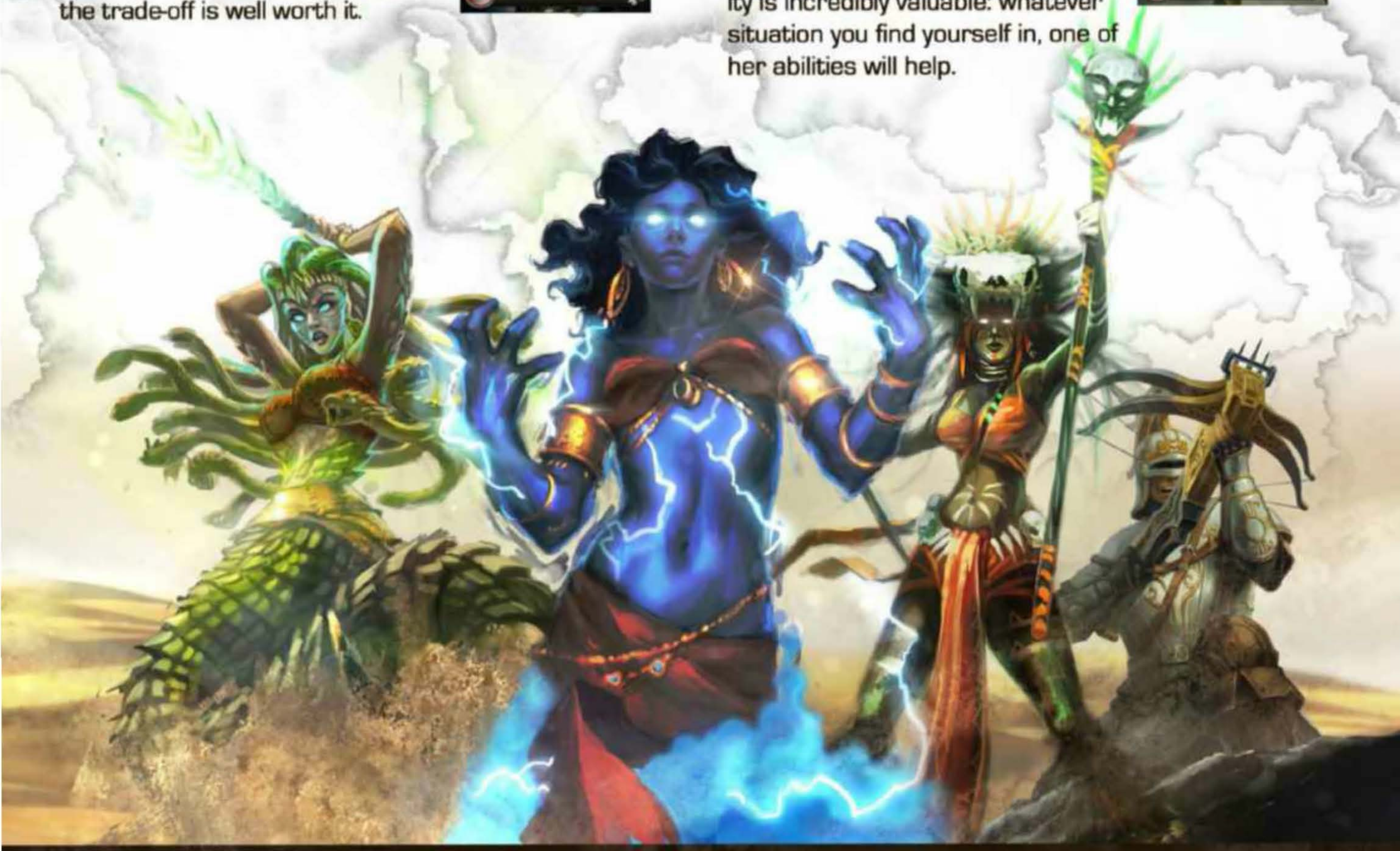
This magical demonoid lady has a lot going on, but her biggest impact play is that she stops all players from drawing extra cards during their turn. You won't always want her in your lineup, but she's a great addition if you know your opponent plans to draw extra cards often.

DARK ASSASSIN

This all-in offensive weapon is one of the most sought-after cards at the Altar of Wishes. He hits very hard, but has a small health pool and deals one damage to your hero every time it attacks. However, if you can keep it alive and swinging, the trade-off is well worth it.

ASALAH, INVOKER OF CASTIGATION

This hero hunts down criminals and practitioners of forbidden magic when not leading your army to victory. Her powers let you draw cards, boost your stats, and buff up enchanted creatures. That flexibility is incredibly valuable: whatever situation you find yourself in, one of her abilities will help.



Mouse Roundup

EENY, MEENY, MINY MOUSE

SIX CUTTING-EDGE GAMING MICE. WHICH ONE BELONGS IN YOUR PAW?

BY ALEX CASTLE

We tend to think of some PC components as having a longer shelf life than others. A video card gets out of date faster than a motherboard, which gets out of date faster than an optical drive, for instance. Some people think that a mouse falls way down at the bottom of that list, somewhere between a power supply and the screwdriver you use to put the whole thing together, but those people have got it all wrong.

Your mouse has a huge effect on how effectively you use your computer, and mouse technology evolves every year. Last year's killer feature becomes this year's baseline. Performance that was once top-of-the-line starts to make an appearance in the bargain bin. So if you're still using the same crusty old mouse from half a decade ago, or if you've never made the jump to a true gaming mouse in the first place, you owe it to yourself to take a look at what's on the market right now.

To help you out, we've rounded up six premium gaming mice spanning multiple price points and niches and put them to the test. Each one has been rated based on its features, build quality, performance, and software support. Some of these mice are among the best we've ever tested, so read on and find out how you're going to control your next PC.

LOGITECH G602

Is it time to cut the cord?

A LOT OF GAMERS STILL have the idea that a true gaming mouse can't be wireless—that wireless mice lag and are unreliable and will totally wreck your K/D in Call of Duty. Fortunately, that idea has been proven wrong repeatedly recently, as multiple companies have released high-quality wireless gaming mice. With the G602, Logitech has pounded another nail in that myth's coffin.

The G602 is a wireless mouse with a solid, all-purpose set of features. It has plenty of buttons, including a bank of six bindable keys accessible to your thumb, which allows it to work fairly well for MMO or FPS gameplay.

It's long, with a high-arched design that will work best for those who prefer a full-palm grip, and the construction is top-notch. A rubber pad on the palm makes the mouse easy to hold on to, and the textured plastic around the sides of the mouse feels very durable.

The G602 isn't rechargeable, but it is designed for extreme longevity. Logitech claims that in gaming mode, a single set of two AA batteries will last for 250 hours. During our testing, we weren't able to make a dent in the battery meter, so we're not inclined to disagree.

In order to provide longer battery life, Logitech went with an optical sensor. We found the tracking to be quite good, though the maximum 2,500 dpi and 500Hz polling rate might be too low for some gamers. Logitech's software is usually solid, and the G602 is no exception.

If you're looking for a wireless-only mouse with plenty of features for any type of gaming, you won't be disappointed by the G602.

The Logitech G602 features plenty of thumb buttons.

VERDICT **9**

Logitech G602

$80, www.logitech.com

MAD CATZ R.A.T. M

A super-small mouse with some full-size problems

YOU'VE GOT TO HAND it to Mad Catz—the company is not afraid to try new things with its peripherals. This derring-do was apparent with the über-customizable R.A.T. 7, which was truly innovative. With the R.A.T. M, Mad Catz tried something new again. This time, however, it didn't work out so well.

The R.A.T. M is a gaming mouse designed for portable gaming. It's wireless, powered by two AAA batteries, and absolutely tiny, so you can throw it in your laptop bag. It can be used as a Bluetooth mouse, though it also comes with a low-profile USB dongle that stows away under the mouse when not in use. As is usually the case, we found the USB mode to be more dependable than Bluetooth. A laser sensor provides great tracking on nearly any surface.

Unfortunately, for all its portable conveniences, the R.A.T. M just isn't comfortable to use. The palm rest on the mouse extends, increasing the overall length, but even at its very longest, the mouse is still quite small, leaving your hand in a cramp-inducing extreme arc. Worse, the palm rest doesn't lock into place, so during the course of normal use it would almost constantly get shoved back into its shortest setting, rendering the mouse incredibly uncomfortable to use for more than a short while. There are plenty of buttons on the R.A.T. M, but most of them are quite difficult to hit, due again to the mouse's small size.

A portable mouse is always going to be a compromise, but at $130 MSRP, the R.A.T. M asks too much, and offers too little.

With the R.A.T. M's palm rest extended, the mouse is almost big enough to comfortably use.

VERDICT **6**

Mad Catz R.A.T. M

$130, www.cyborggaming.com

TT ESPORTS THERON

Aside from some flashy lights, does this newcomer bring much to the table?

TT ESPORTS IS THE peripherals division of Thermaltake, and one of the newer entrants into the increasingly crowded market. While the Theron isn't the flashiest mouse we've seen, it's a very solid piece of hardware, and a sign that the company's serious about competing.

The Theron is an especially boxy mouse, with very wide, flat buttons and a nice clicking action. When powered up, it emits light from the scroll wheel, dragon logo, and from three LEDs located around the bottom, lighting up your desk under the mouse.

The mouse features the sort of "soft-touch" rubberized surface that's popular on a lot of gaming mice. Though it feels nice to the touch, these coatings have a tendency to make your hand feel sweaty quickly, and the Theron's in particular started to show grease and fingerprints right away.

On the underside of the Theron is a hatch that opens up to reveal a bank of five 4.5 gram weights, which allows you to substantially alter the overall weight of the mouse. It has two additional thumb buttons, one pinky button, and two DPI buttons. All are bindable, though the DPI buttons are placed far enough back from the thumb wheel that there's no real hope of hitting them in the heat of battle. Our only real complaint about the construction of the mouse is that the scroll wheel felt a little flimsy in its socket—otherwise, the Theron is quite solid.

Like a souped-up street racer, the Theron features customizable underlighting.

The Theron doesn't do much to stand out among the other mice in its price range, but it's hard to find specific things to fault it for. It's an all-around respectable option.

VERDICT **8**

Tt eSports Theron

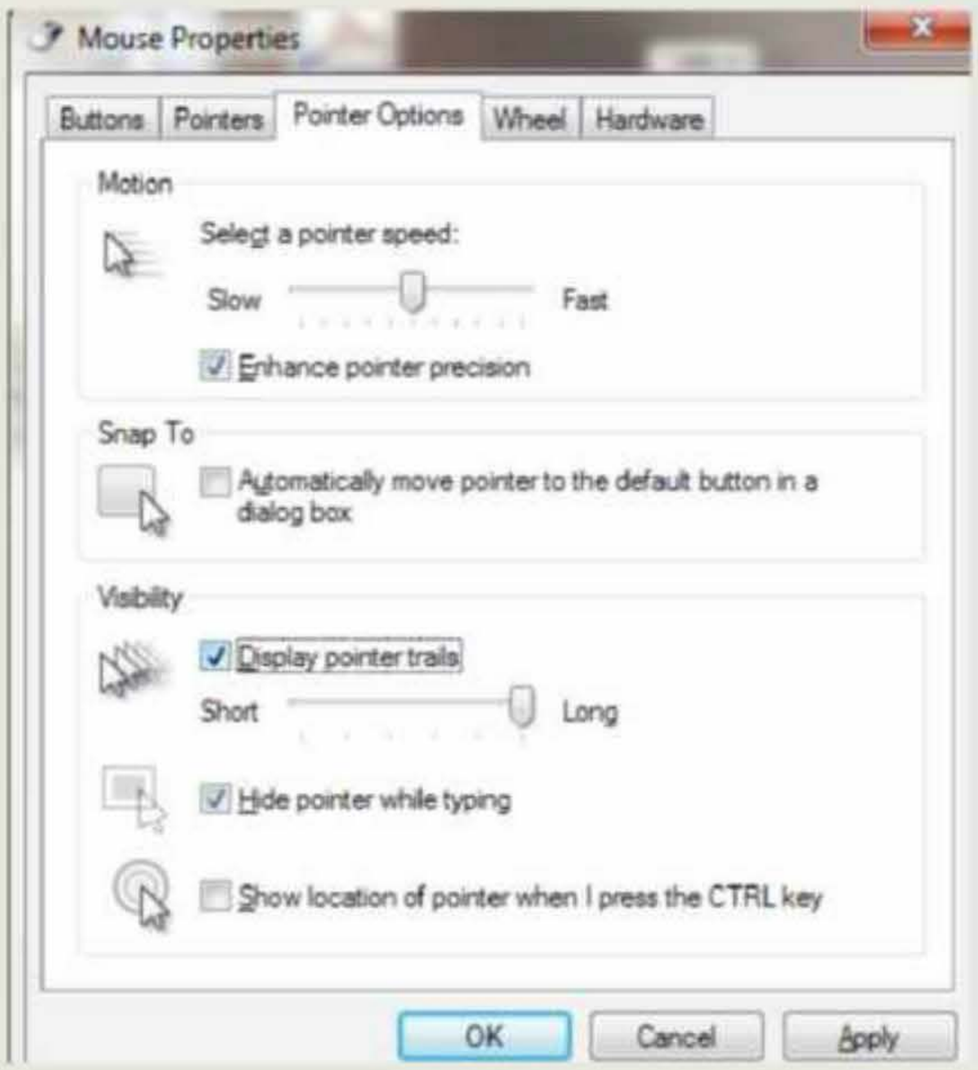
$70, www.ttesports.com

UNDERSTANDING MOUSE SETTINGS

In Windows, there are really only three important mouse settings, and they are all located in the Mouse Properties panel. You can access this panel by opening the Control Panel, clicking Hardware and Sound, and then Mouse. Here's what you need to know.

Pointer Speed This slider adjusts how fast your pointer moves, of course, but the real secret is that you shouldn't ever need to use it. Any modern gaming mouse will allow you to set custom dpi levels, which adjust how sensitive the mouse is. Higher sensitivity will make the pointer move faster. If you instead keep the mouse sensitivity set low, and increase the pointer speed in Windows or in a game, your mouse accuracy will suffer.

Mouse Acceleration Mouse acceleration causes the mouse pointer to move farther based on how fast you're moving the mouse. So, quickly jerking the mouse over an inch will move the pointer farther than slowly dragging it that same inch. Many people find that this feels natural, but for some types of games where extreme mouse precision is required it may be undesirable. To disable it, uncheck the box labeled "Enhance pointer precision."



Scroll Speed This last one is more of a convenience than a performance issue. If you find that your mouse wheel scrolls through documents too slowly or too quickly, you can adjust that rate in the tab labeled "Wheel."

ROCCAT KONE PURE COLOR EDITION

Sometimes beauty is more than skin deep

"PURE" IS A GOOD NAME for this version of the Roccat Kone gaming mouse—it's all about pure performance. It doesn't have a billion buttons, or removable weights, or any other extraneous features. Instead, the Kone Pure focuses on doing a smaller number of things well.

For one, the Kone Pure offers great tracking, with a top-notch 8,200 dpi laser sensor. The mouse's lift-off distance can be customized, if you like to really fiddle with your mouse's performance. It also features half a megabyte of onboard memory, and a 32-bit processor, so you can store your profiles and macros directly on the mouse, and use them anywhere.

Because the mouse is a little on the shorter side, we recommend it most for those who hold their device with their fingers bent, or who have smaller hands. The Color Edition we were sent for review is treated with a breathable matte finish and bright "Cool Blue" paint job. Of course, beauty is in the eye of the beholder, but to our eyes this thing is absolutely killer.

The Kone Pure's software is a little cluttered, but generally up to the task of accessing the myriad ways you can customize the mouse. The mouse features four buttons in addition to the standard three, but one of the thumb buttons acts as a shift key, effectively doubling the number of keys or macros you can bind.

The Kone Pure comes in an array of limited-edition colors.

The Kone Pure's the real deal. It may not be perfect for everyone, but for most folks it's a great option.

VERDICT **9**

Roccat Kone Pure Color Edition

$70, www.roccat.org

CORSAIR RAPTOR M40

What a difference $10 makes

THE RAPTOR M40 OCCUPIES a curious space in Corsair's too-dense lineup of gaming mice. With an MSRP of $60, it's priced right at the bottom end of what we'd normally consider the premium gaming mouse market, yet it's feature set is more in line with what you'd find in a budget mouse.

It is, essentially, a stripped-down version of Corsair's M65 gaming mouse, which has an MSRP of $70. The two share the same overall shape and design, but the M65 features an aluminum baseplate, a useful DPS-switching sniper button, and, most importantly, a laser sensor. The M40, by comparison, is all plastic and has an optical sensor.

We experienced a noticeable performance dip switching to this M40 from the other mice in this roundup, including tracking problems on some of our test surfaces. Without many other features to speak of, the optical sensor is a strike against the M40.

Otherwise, the M40 is perfectly decent. The software is a little clunky but serviceable, and offers profiles with multiple DPI settings and user-defined macros. Under the mouse, three separate weight chambers allow you to customize how the M40's weight is distributed, which is a nice touch.

Under the M40, you'll find three separate weight chambers.

Ultimately, the M40 isn't *bad*, it just doesn't offer a great set of features at this price. If you like the design, we strongly recommend paying the extra $10 for the M65. Otherwise, you can get more mouse for $60 elsewhere.

VERDICT **7**

Corsair Raptor M40

$60, www.corsair.com

RAZER OUROBOROS

Razer redefines 'top of the line'

THE OUROBOROS TAKES a page (or maybe even a whole chapter) from the Cyborg R.A.T., the mouse that introduced the idea of a fully customizable device. Like that model, the Ouroboros's length can be adjusted, and you can swap out the mouse's side-plates, choosing between flat panels and flared wings. You can also fine-tune the angle of the palm rest, giving the mouse more or less arch as you desire. Somewhat surprisingly, the Ouroboros does not offer any sort of weight adjustment—a feature that's started to pop up in a lot of high-end mice.

The design and build quality on the Ouroboros are both excellent. It's got an aggressive, boxy look and lacks the swoopy lines of Razer's other mice. It's also perfectly symmetrical, so it works equally well for left-handed gaming. A detachable USB cord allows the mouse to be used wired or wirelessly, with a small recharging station that doubles as the wireless receiver.

Razer's software is reliably high-quality, and the Ouroboros is no exception. As with all products using the Razer Synapse software, you have to sign up for an account to use it, which is silly, but once you do, you get access to pretty much every customization feature you could ask for in a mouse. Button bindings, macros, profiles, the works—in a slick, easy-to-use package.

The Ouroboros can be adjusted to fit any size hand.

The bottom line is that this mouse is top of the line, and it's priced to match. If you want a mouse that can do it all, and don't mind spending a bundle, this is a great choice.

VERDICT 9 KICK ASS!

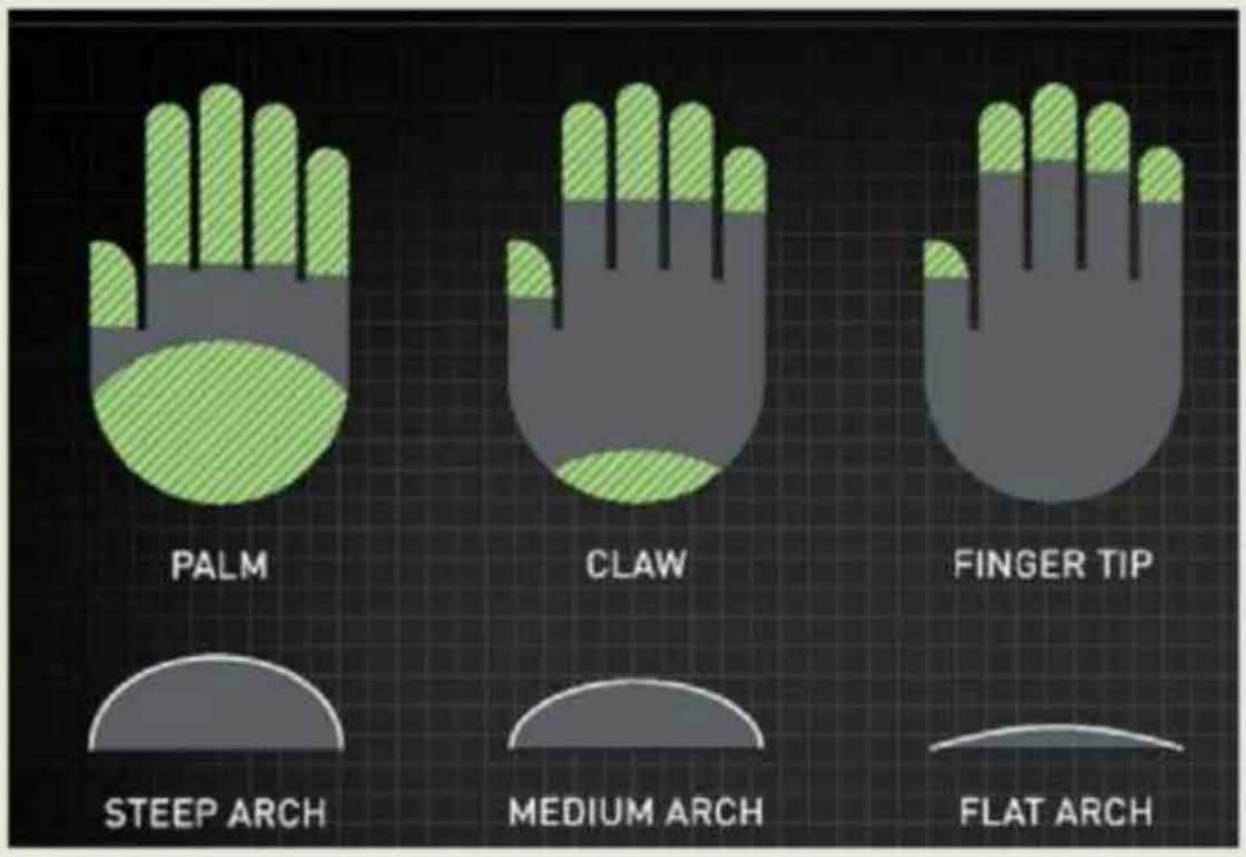
Razer Ouroboros

$150, www.razerzone.com

KNOW THE LINGO

There's a lot of jargon used in marketing material for gaming mice. Here are definitions for some of the most common terms.

DPI Short for "dots per inch," dpi is the measure of a mouse sensor's maximum sensitivity. A higher dpi value lets you move the pointer faster without sacrificing any accuracy. Dpi is important, but note that dpi values higher than 2,000 only really matter if you prefer very fast, "twitchy" pointer movement. Anything much higher than 4,000 or so is unlikely to actually come up in real-world use.



Polling Frequency This is how often the mouse sends new location information to your PC. A higher frequency means a quicker response time, though, as with dpi, it will be difficult for you to perceive differences in polling rates above 500Hz.

Onboard Processor/Memory These features allow you to store profile information and performance settings directly on a mouse, so they'll work on any computer the mouse is plugged into. This is useful, but some marketing materials oversell the utility of having a processor in your mouse.

Grip Style Razer marketing in particular likes to describe each mouse as being best for one particular grip style or another (see image). The major thing you should be aware of is whether you like to lay your palm and fingers flat on the mouse, or raise them up in an arch, so only your fingertips and the bottom of your palm touch it. The former favors a long mouse, with a higher, ergonomic arch.

The Othe Crowdfun

CROWDFUNDING SITES HAVE MADE IT POSSIBLE TO RAISE MONEY FOR A BUSINESS VENTURE FROM YOUR COMPUTER. WHILE KICKSTARTER IS KING IN THIS REALM, THERE ARE OTHER NOTEWORTHY ALTERNATIVES. WE KICK THE TIRES ON THREE OF THEM **BY MARK PILKINGTON**

Trailblazers

What do Bret Easton Ellis, Ricki Lake, and Whoopi Goldberg all have in common? Believe it or not, they have all successfully launched projects through Kickstarter—the world's largest crowdfunding site. They're not alone, either; since the site first debuted in 2009, more than 5 million users have made donations, funding over 50,000 individual ventures that otherwise would never have seen the light of day. It is fair to say that Kickstarter has been a modern phenomenon, helping to fund a wide variety of different projects, from video games to fashion labels and even multi-million dollar feature films. It truly is an entrepreneur's playground.

But while Kickstarter is number one for a reason, being top dog doesn't necessary mean it's the right choice for you. Competition is rich in the crowdfunding sector, with literally hundreds and hundreds of sites out there all vying for your attention, so you are hardly stuck for choice when it comes to alternatives.

If you are keen to get involved with crowdfunding, either by donating and supporting projects, or by seeking financial backing for you own brilliant idea, it's really worth your while to explore many avenues before making any commitments. Indeed, you may already have used Kickstarter and found it difficult to raise funds, and are wondering which other sites have a good track record of raising money. The problem is, there are just so many to choose from. Which ones should you consider?

Leaving aside the specialist sites that concentrate on one particular area or industry, here at *Maximum PC* we have done all the hard work for you, whittling down the hundreds of Kickstarter alternatives to three main contenders: Indiegogo, Rockethub, and Fundable. Read on, to find out how they differ from Kickstarter and why they might be worthy of your attention.

A word of caution: Unfortunately, there are no guarantees with crowdfunding that you will be able to safeguard your ideas or any investments you make. Any money you decide to commit to a project is done at your own risk.

INDIEGOGO

PIONEERING CROWDFUNDING SITE BOASTS OPENNESS

Arguably Kickstarter's biggest and longest running rival, Indiegogo started life in 2007 when Danae Ringelmann met fellow business partners Eric Schell and Slava Rubin while attending the Haas School of Business at the University of California. They shared a common goal of creating a fund-raising model that would allow people a means of raising revenue for their business ideas. They officially launched Project Keiyaku—an early version of Indiegogo that, to begin with, focused purely on funding movies—at the Sundance Film Festival in 2008.

Since those early days, the site has changed its name to Indiegogo and diversified the projects it hosts to cover just about any venture an entrepreneur can think of. In the ensuing five years, the site has emerged as one of the perennial crowdfunding ventures, having launched over 50,000 campaigns. Indiegogo removed the middleman and helped pioneer the way for the "modern" crowdfunding solution, influencing numerous other sites, including Kickstarter itself.

Indiegogo doesn't just limit itself to business ventures; it covers pretty much everything—you will find just as many private causes, such as appeals to raise money for charity or helping the needy, as you will more commercially minded projects. The site prides itself in its openness; you can take part no matter what country you come from—as opposed to Kickstarter's limits on residents of the United States, United Kingdom, Canada, Australia, and New Zealand—and over a third of Indiegogo's business is conducted globally, making it a truly international venture.

HOW IT WORKS

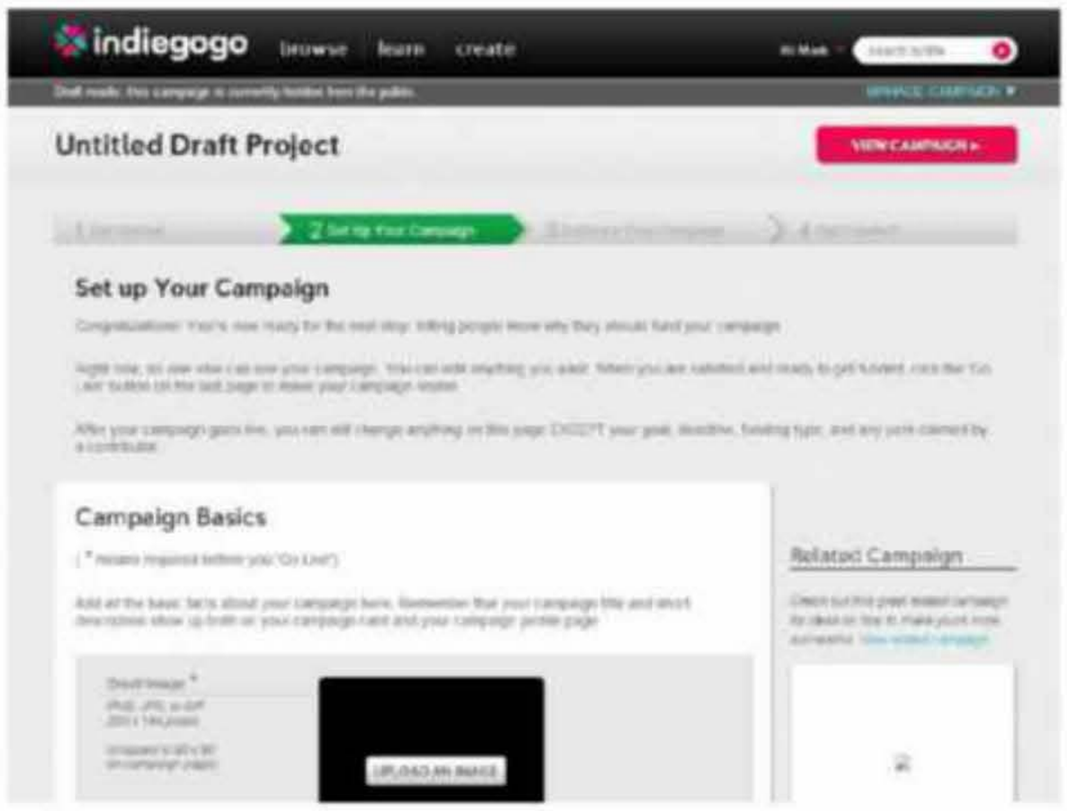
Open to any industry and any idea (as long as it's legal), Indiegogo isn't fussy when it comes to what you can raise money for—unlike many of its rivals that impose restrictions on what type of campaigns you can run, Indiegogo is free of rules, no matter how serious or trivial your idea. You can even raise money for personal needs if so desired, although your needs would probably have to be pretty compelling to get people to part with their money.

To get started at Indiegogo, you have to set up an account and a funding page. You then decide on a list of perks to offer users who donate, depending upon their level of investment. It's then up to you to promote your Indiegogo page through social networking platforms in order to gain publicity.

You keep all of the money a campaign generates until its target revenue is achieved, and there is no limit to the amount you can raise. Once your campaign has reached its goal, a charge of 4 percent is levied to Indiegogo. Should your campaign not reach its goal, then you have the choice of keeping all of the money raised thus far, but paying a 9 percent fee to Indiegogo because you didn't reach your stated goal, or simply refunding all of the money back to your donors.

BENEFITS OVER KICKSTARTER

More favorable rates and a greater diversity of projects allowed on the site are the two main reasons you might opt for Indiegogo. Unlike Kickstarter, Indiegogo distributes your funds immediately when contributions are taken through a donor's PayPal account. On the flipside, payments made by credit card are held by Indiegogo until the end of the campaign. Indiegogo's 4 percent charge



Setting up a new project on Indiegogo is both quick and easy—the step-by-step guide takes you through everything you need to do in order to get your project up and running.

for funds (when the target is reached) also bests Kickstarter, which charges a 5 percent commission on successful campaigns. As mentioned above, you can even keep the money if your project doesn't reach its goal, for a nominal 9 percent charge. Kickstarter users don't have this option—if a project doesn't reach its goal, they will receive no money at all.

As mentioned earlier, Indiegogo tends to support any project, no matter what it is. If your project doesn't meet Kickstarter's criteria—such as not allowing you to raise money for causes—then chances are Indiegogo will accept it.

Size really does matter when it comes to running a successful publicity campaign, and Indiegogo scores high in this area, too. Half the battle when running a promotion is finding an audience with which you can engage. Being the second-largest crowdfunding site on the Internet, Indiegogo ensures your project will be part of a vibrant community that will share your project with their friends and grow a following organically.

NOTABLE PROJECTS

With tens of thousands of successful campaigns under its belt, it is not surprising to find that Indiegogo boasts a number of famous projects. *Let's Build a Goddamn Tesla Museum* was launched to es-

An Indiegogo project in action: Genesis 3D Movie is going great guns, and thankfully has nothing to do with the Phil Collins band of the same name.

tablish a science museum in Long Island, New York, and sparked a surge of public interest, with the campaign taking home $1.7 million in just six days.

Canary: the First Smart Home Security Device for Everyone broke the Indiegogo record for most money raised for a project, at $1.9 million. Its original goal of a modest 100K was met within a few hours of its launch in July this year, and it went on to gather contributions from nearly 8,000 users across the world.

Indiegogo's most famous project, however, was *Let's Give Karen – the Bus Monitor – H Klein a Vacation!* After a number of disturbing videos were posted online depicting a hapless bus monitor being ruthlessly bullied by students, a campaign was set up to give Karen a well-deserved vacation. The original goal was to raise $5,000, yet all in all $703,833 was raised by people sickened by what they saw. The victim of the videos said she planned on using $100,000 of the money toward setting up an anti-bullying foundation.

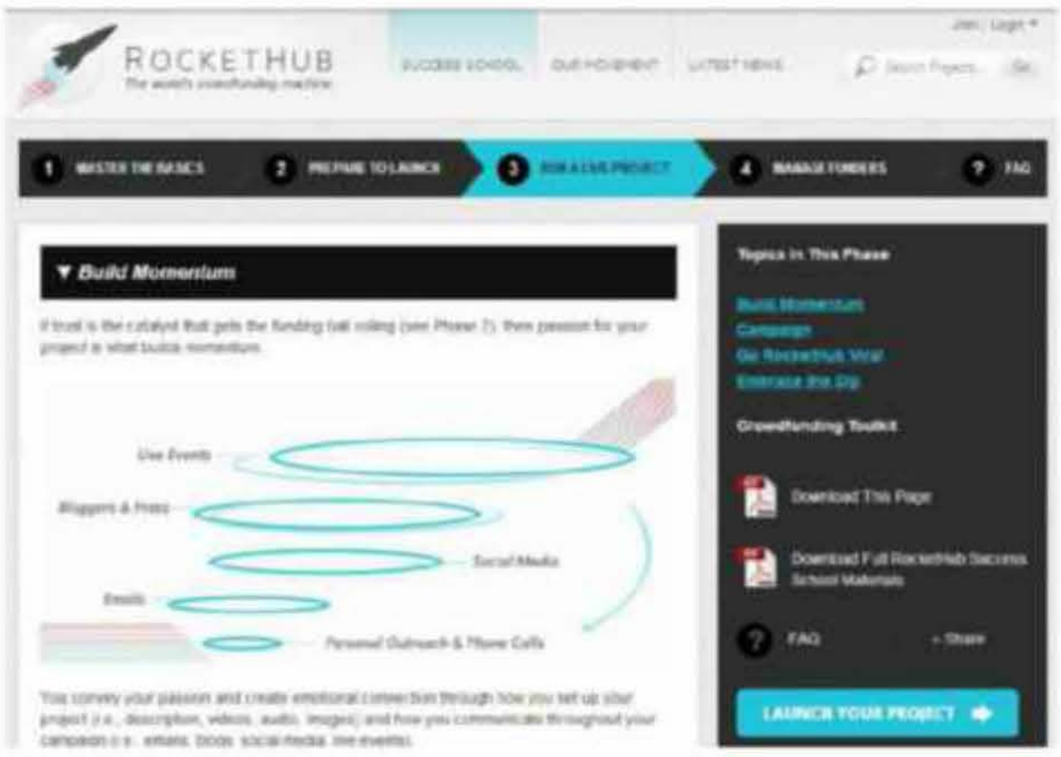
ROCKETHUB

LINKS TO A CABLE TV NETWORK GIVE IT AN EDGE

Founded by Brian Meece, Jed Cohen, and Vladimir Vukicevic, (with a forth owner, Alon Hillel-Tuch, joining a year later), Rockethub officially launched back at the start of 2010 as a means of raising money for creative projects. The owners were all from creative fields themselves, and the site came about partly because of the frustration they experienced in trying to find backing for their own individual interests. The idea was to establish a free market where artists could easily be put in touch with the financial backing they needed.

In layman's terms, this very loose remit means that Rockethub could cover any industry or idea in order to encourage as many entrepreneurs as possible. That said, however, there tends to be a much stronger focus on science and technology projects compared to many of Rockethub's crowdfunding rivals. So don't be surprised to find an in-depth planned study of microbes sitting alongside more commercial projects, such as a fashion label or music album, as you explore the site.

Earlier this year, Rockethub announced a partnership agreement with the A&E television network. Together they created www.projectstartup.com, a multiplatform website produced in conjunction with the cable television channel that features handpicked projects from Rockethub entrepreneurs.



Rockethub's Success School teaches all you need to know about mastering the fine art of crowdfunding, so your project has a better chance of reaching its goal.

5 STEPS TO GETTING ATTENTION

Your project may be the best thing since sliced pizza, but no matter how innovative it is, unless you attract the attention of others, you will struggle to find the financial backing needed to get it off the ground. After all, your project is just one of hundreds on a given site. So, how do you make your project stand out from the crowd and get the attention it deserves? Here are our five top tips for crowdfunding glory.

Best Practices Before you rush headfirst into a campaign, take your time and study what others have done first. Look at what projects have been successful, and find out how they set about attracting publicity and backing. Follow their lead and use their success as an inspiration.

Be Prepared to Change Devise a flexible business plan that will allow you to adapt should your original idea need tweaking. If things are not going to plan, you will need to be prepared to make changes so you can appeal to your target audience. By repositioning your product if needed, you could achieve greater results and more backing.

Plan Ahead Even before you have reached your goal, make sure you have all eventualities covered should you get asked any tricky questions about your project's launch and long-term future.

Embrace Social Media Twitter and Facebook are powerful tools when it comes to promoting your ideas. Not only can they help spread the word, but they can also be a useful forum for gathering feedback from your fans and followers.

Be Ready to Go Prepare for your project's completion. You should devise a marketing plan that you can start using straight away, along with lining up any suppliers you may need to use once your project is launched. This way you will hopefully be able to eliminate long delays after you reach your goal.

HOW IT WORKS

For newcomers to crowdfunding, Rockethub has an introductory site called the Crowdfunding Success School, which takes you through each and every aspect of running a successful campaign. A crowdfunding 101, it shows you how to network your idea, decide upon goals, and best practices to help attract and manage the expectations of the people who fund you. It makes for compelling reading, even if you eventually decide to use another site.

Rockethub encourages its users to spread the word about projects and complete set tasks, such as voting on others' projects to increase exposure, and it rewards contributors with badges for their efforts. The more badges you gain, the greater your status as a power user, who others will turn to for advice.

As with other crowdfunding websites, after setting up a campaign, you decide on how much you are looking to raise and the time frame for your goal. You then decide what rewards you will give to donors in return for their backing. You will be charged a 4 percent fee (along with a 4 percent credit card handling fee) for the total money you raise should your campaign prove to be a success. Rockethub also allows you to keep the money raised even if you don't meet your goal, at a rate of 8 percent (plus a 4 percent processing charge).

BENEFITS OVER KICKSTARTER

Rockethub is a fast-growing site, and is developing at a rapid rate. Like Indiegogo, Rockethub is much more open about what you can cover in terms of projects, so if you find you cannot get featured in Kickstarter, Rockethub may be the answer. In particular, you should consider using Rockethub if you have a scientific or technical project, as there seems to be a greater emphasis on those industries than on other sites.

Unlike Kickstarter, Rockethub allows you to keep all the funding you raise even if you do not make your set financial goal. Granted, if you choose to do this you still have a charge to pay (8 percent), but if you feel your project is still viable even without all of the money you originally wanted, this could be the better option for you.

Rockethub also has a partnership with the A&E television channel. If your idea is innovative enough and you decide to apply for it, your project may be handpicked to feature on A&E's special project startup website, thus earning even more exposure and the potential for donations. In addition to that, A&E will also offer funding and specialist coaching for your project, which means success is almost guaranteed.

The Project Startup website is run in conjunction with A&E Networks to showcase the very best projects on Rockethub.

NOTABLE PROJECTS

The gaming and web culture video series *Extra Credits* is Rockethub's most successful venture yet. The comedic web series discusses video games, with an emphasis on game design and using them as teaching tools. The idea proved to be incredibly popular, with the original goal of $15,000 ending up at a staggering $103,814 raised. The creators have vowed to use a portion of the money raised to help other like-minded businesses grow.

AFIA: Save the World... One Dress at a Time, is one of the most noble projects to find funding, having raised $4,790, which is going to help people in Ghana. The project funds dressmakers in the African country, helping poor yet talented seamstresses acquire a fair wage and a larger market for their dresses, allowing them to be sold in the United States and other places.

A special mention must also go to *Chomp! Chomp! Chomp!*, a clever idea that combines an illustrated children's book with a tie-in app. The highly educational app includes a system that encourages young children to read—a page of text is shown before they are rewarded with a picture. The goal was met, with the project having raised a grand total of over $15,000.

FUNDABLE

THE FIRST SITE TO OFFER THE OPTION OF EQUITY BACKING

The most recent crowdfunding option here, Fundable was launched just last May, but has already experienced incredible growth and success during that short period of time. The site began life as a donation-only platform, but a few months later, taking advantage of President Obama's 2012's JOBS (Jumpstart Our Business Startups) Act, founders Wil Schroter and Eric Corl started allowing users the option to purchase equity in projects featured on the site. The JOBS Act legitimized equity crowdfunding and allowed budding entrepreneurs the ability to publicize that they were looking for backing. As a result, Fundable became one of the first crowdfunding sites to take full advantage of the act, and now runs as a dual-funding model. Fundable offers either donations or project equity, largely depending upon how much money a project's goal has been set to—for larger projects looking to raise more than $50,000, Fundable recommends the equity option.

Fundable is a serious crowdfunding company, and as such it carefully vets its users. Only accredited investors—people with a net worth of over $1 million or an income of $200,000 in the past two years—are able to take part in offering equity funding to a project. Although in theory anyone can start a project, they will still have to apply in order to be approved for the site by the powers-that-be. No charitable projects are allowed, nor are any forms of gambling or money services, among other prohibited campaigns. Many more crowdfunding sites surely will follow Fundable's lead and venture into equity crowdfunding, but by being the first to do so, Fundable has gained a priceless foothold in the market.

HOW IT WORKS

As mentioned above, there are two models you can choose from for raising money on Fundable—either from donations or through equity backing for your business. For both methods, you will need to apply to be featured on the site. Once approved, you then create a profile page that covers your project overview, your goals,

and rewards for investment. Additionally, along with their public profile, equity-based projects will also need to create a private page that contains your business terms and related documents. Along with being featured on the site itself, you will also promote your page through the normal social media channels in order to gain interest.

In terms of costs, entrepreneurs are charged a $99 fee each month that a campaign is running. The flipside of this is, should a project reach its goals, then no final fees are applied. You will only be able to collect your money once your pre-determined goal has been reached. This monthly charge may put a lot of people off, especially if you have the slightest doubt about raising enough capital to get your company started, but this just reinforces Fundable's place in the market for serious businesses only.

BENEFITS OVER KICKSTARTER

Fundable has been dubbed the Kickstarter for the corporate community. The equity fund-raising option is the obvious difference from Kickstarter, allowing you to sell shares in your business as opposed to offering rewards for donations. You can decide whether to go this route or stick with the more traditional crowdfunding method of raising money, although you could argue that equity is more suited to business startups. Donations are fine for creative projects, but do not offer the long-term investment possibilities that equity backing does. As more and more crowdfunding sites start to take advantage of the JOBS Act, expect to see equity fund-raising grow in popularity.

NOTABLE PROJECTS

There are a number of projects of note that have used Fundable to establish financial backing. The Fleksy app closed at $900,000, and this revenue was part of a $3 million investment raised by parent company Syntellia to develop and market a software keyboard that helps to improve typing accuracy. The company used the $900K to release the app onto iOS and plans to release versions for Android and Windows 8 in the near future.

Celebrity Webchefs does what it says on the box and uses well-known celebrities to explain their culinary secrets in a series of easy-to-follow videos. Famous faces that have lent their names and cooking expertise to the videos include Gretchen Rossi from *The Real Housewives of Orange County* and Alan Thicke, the star of *Growing Pains*. It's a bold and innovative idea that, thanks in part to the star power behind it, has gained a lot of media attention. The venture was funded for $435,000 in total.

FUNDABLE
Online Funding Platform for Small Businesses
Promote your business with a beautiful company profile
Allow investors to support your company for as little as $1
Streamline fundraising with online transactions and promotion
Build Your Company's Profile
Raising $1,000,000
Wondering How Fundable Works?
Learn More
Contact Us
New & Noteworthy Companies on Fundable

Looking for equity backing? Fundable is the place to go, being one of the first websites to take advantage of the JOBS Act.

WHEN CROWDFUNDING GOES BAD...

On the surface, crowdfunding seems like a great idea. But while the success stories get trumpeted for all to hear, there are even more tales of woe. It can be a risky business, not to mention a potentially humiliating one. Be it stolen ideas, poor planning, or a rushed campaign, here are the main pitfalls you should be wary of.

Exposing your Business Plan They say that imitation is the sincerest form of flattery, but in the crowdfunding world, a good idea is there for your competitors to see and steal for themselves. There is nothing to stop them from taking your idea and presenting a similar one themselves, so be aware that when you launch your campaign that it may only be a matter of time before it is emulated. Depending on your idea, it may well be worth taking your time to complete an IP (intellectual property) process.

Tax Problems The money you raise from crowdfunding isn't necessarily all yours to spend. Just as with any other business, you will need to declare your earnings to the appropriate authorities, and depending on what country you live in, this money may well be taxable. A qualified accountant will be able to help you here, although remember they will want payment for their services, too.

Keeping Control Should you choose an equity-based crowdfunding model, be careful to keep a controlling stake in the company you are raising money for, whether it's a new or existing business. Your stakeholders have a vested interest in your project; just make sure they do not wrestle the whole thing away from you.

Be Realistic While the temptation is always there to exaggerate to potential investors just how great your idea is, try not to build up hopes too much. You don't want your backers to feel lied to or disillusioned; at the very worst, you could end up in court as they try to claim their money back.

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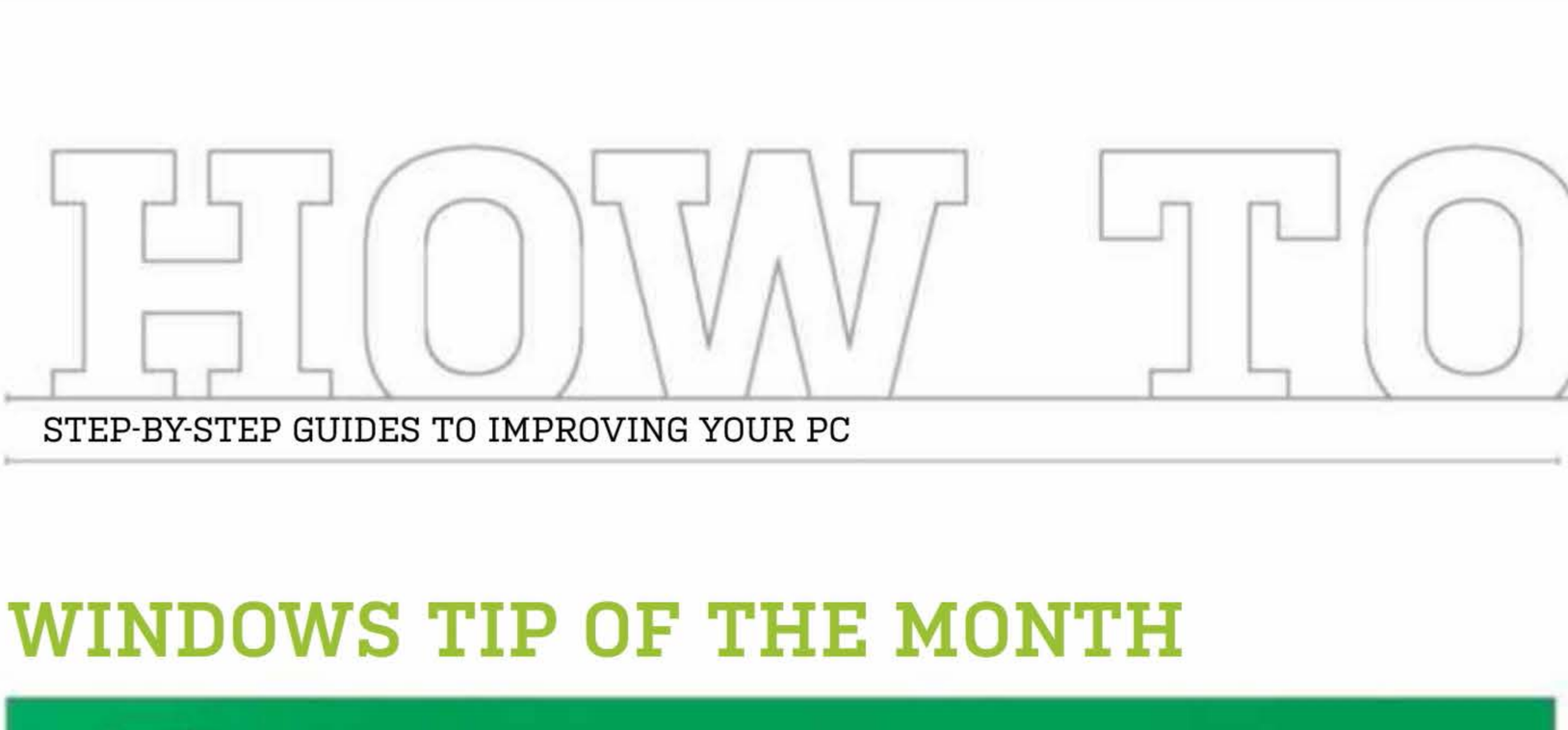
HOW TO

STEP-BY-STEP GUIDES TO IMPROVING YOUR PC

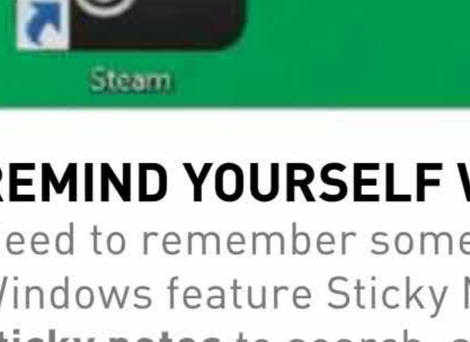
WINDOWS TIP OF THE MONTH



REMIND YOURSELF WITH STICKY NOTES

Need to remember something for just a little while? Use the oft-forgotten Windows feature Sticky Notes. Just open the Start Menu/Start screen, type **sticky notes** to search, and press Enter. You'll see a virtual sticky note appear on your monitor, which you can type into to keep track of a thought.

MAKE - USE - CREATE



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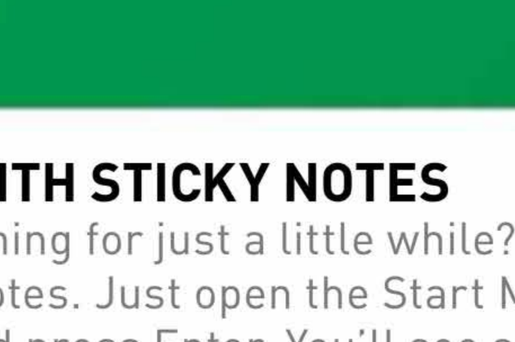
Convert Video Files with VLC



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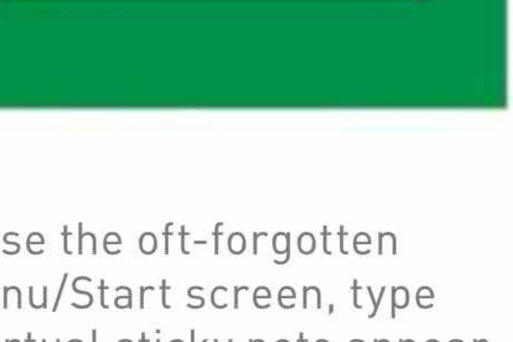
Control Your PC Remotely Using Twitter



66
Download Classic Films for Free

ALEX CASTLE
CONTRIBUTING EDITOR

GONE, BUT NOT FORGOTTEN?

MICROSOFT GIVETH, and Microsoft hath taken away. Sort of.

Windows 8.1 brought a host of new features to play with, but it also brought rumors that several popular features would be disappearing. In particular, the Windows File Recovery backup tool and Libraries functionality are noticeably absent when you fire up 8.1 for the first time.

Microsoft is hardly known for taking quick, drastic action, however, and I was pleased to find out that both of these features aren't actually gone, if you really want them. Windows File Recovery is being phased out in favor of various cloud-based backup solutions, but it's still available to those who want to use it in the Control Panel, under System & Security > File History. It's way down in the corner, and it's now called System Image Backup for some reason, but it's there.

Libraries are even less well-hidden—you just have to right-click on the left side of the file explorer and choose Show Libraries to bring them back. I'm glad that two useful features aren't gone for good, but now would be a good time to start finding ways to live without them.

↘ submit your How To project idea to: comments@maximumpc.com

Convert Video Files with VLC

YOU'LL NEED THIS

VLC MEDIA PLAYER
An incredibly versatile media player that should be on every PC. Get it at www.videolan.org.

VLC MEDIA PLAYER is often called the "Swiss army knife of video players" because it gives you such precise control of nearly every aspect of video playback.

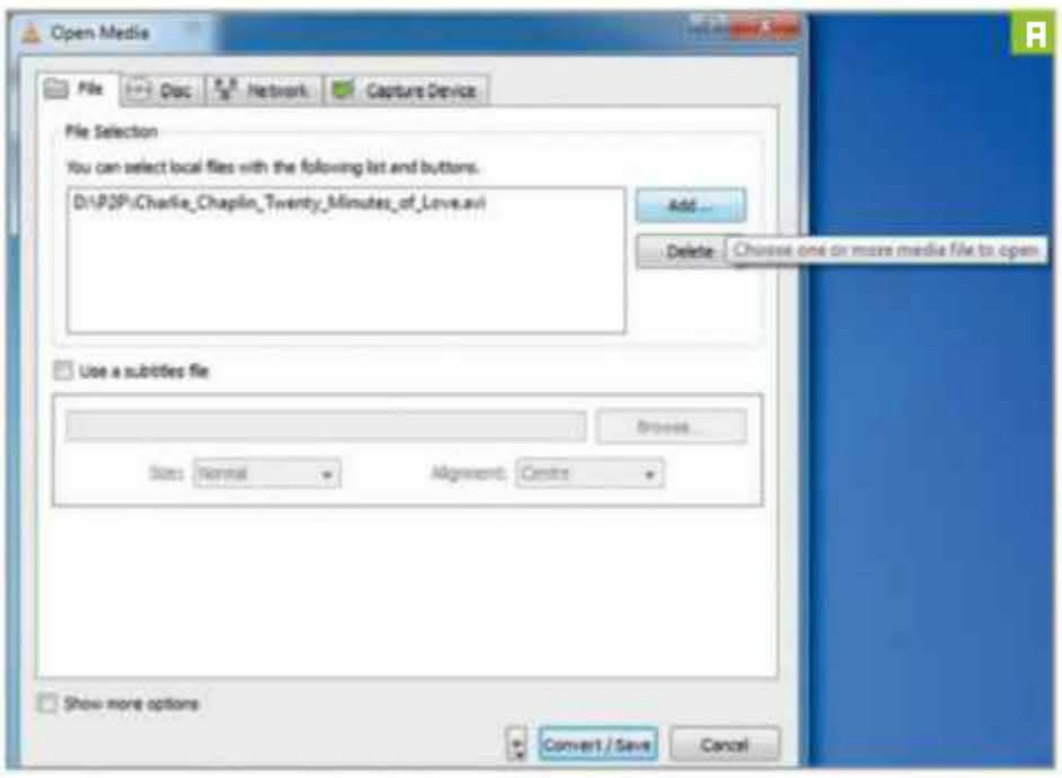
For example, you can change the speed of subtitles, tell the audio to play a bit behind the video to compensate for syncing problems, or change the brightness and contrast. But it's not just a great media player, it's also equipped with everything you need to convert video files to other formats.

Because VLC is open-source software, it's been added to and improved upon by a community of skilled and passionate programmers. You'll also find an array of skins and extensions that will ensure that you want to keep using it long-term. In this tutorial, we'll walk you through some of its main features. **–BOB ADAMS**

1 LOAD MEDIA WITH VLC Install VLC media player after downloading it from the official site (www.videolan.org/vlc). It's a highly streamlined video player, so if you want a more snazzy look, try installing one of the many skins available from Videolan.org. Choose the Skins link and follow the instructions to get one that you like.

» When you're ready to convert a video file, click Media from the top menu and select Convert/Save. Then, in the Open Media window, click the Add button (**image A**) and browse to the location of the file you want to convert. When you're ready, click the Convert/Save button again. There's an option to add a subtitles file if you have one.

» Select the destination folder, give a filename, select the desired video profile, and click Start. By default, VLC media player comes with a few profiles that can convert your video to most of the widely used audio and video formats.



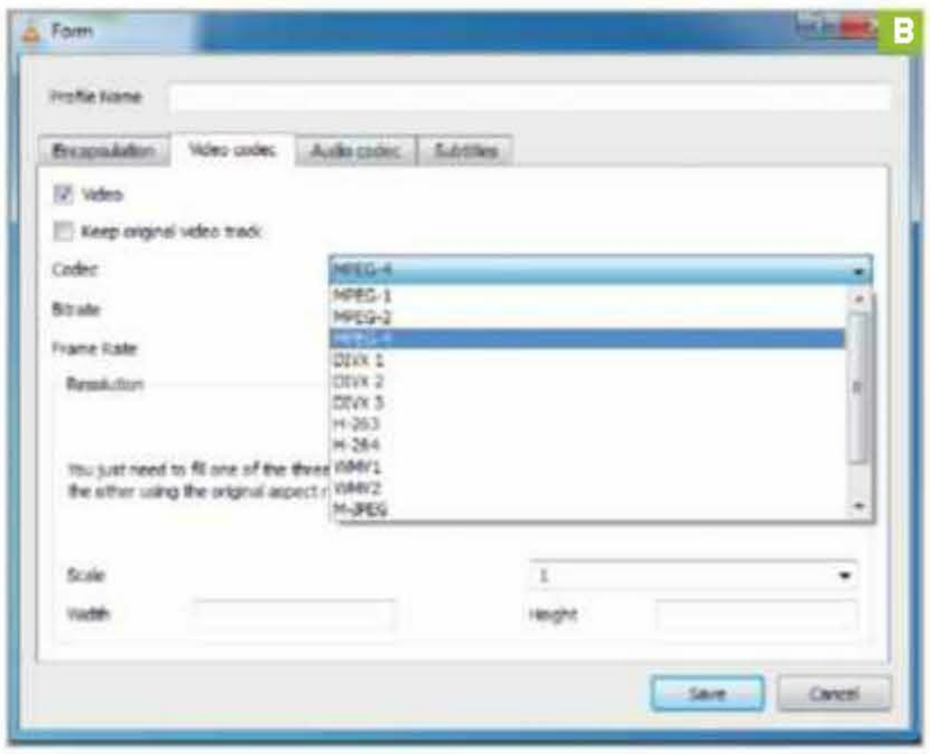
2 CREATE CUSTOM PROFILES You can edit, delete, or create new profiles using the three buttons next to the Select Profile drop-down list. Under the Encapsulation tab, select a file type to convert to (in this example, we're using MP4/MOV). Under the Video Codec tab, pick the MPEG4 codec (**image B**), choose a bitrate and frame rate, then click the Save button. You can define a particular ratio to export your converted file as—ideal if you don't like the format the film was in.

» You will need a bit of knowledge when choosing the best resolution for your output file, which depends on the destination device. Here, we want to play back on a tablet, utilizing full-screen mode. Enter the details in the Width and Height fields and your file will be forced into this ratio (it may crop the original).

» Hit Start to begin the conversion. The main VLC player bar will move along as the file is converted and downloaded. When complete, find the destination folder and double-click to play. You may have Windows Media Player set as your default player. If you want to use VLC, right-click the file, then choose "Open with > VLC media player."

» To add a watermark when converting a video (typically a home movie), all you need to do is navigate to Tools > Effects and Filters. On the Video Effects tab, you need to click the Vout/Overlay sub-tab. Alternatively, you can add a logo on the next sub-tab (Logos)—you can even select the transparency, using the slider.

» We've converted the file and can play it back on our PC, but we chose a resolution suitable for a tablet. Transfer the converted file to your device. You can then play it with the your tablet's video player; if it doesn't support the codec, you may have to search the marketplace for a video player that will, such as VLC.



Send Commands to Your PC Remotely Using Twitter

YOU'LL NEED THIS

TWEETMYPC
This free app is available at http://tweetmypc.codeplex.com.

TWITTER IS RIGHT up there with Facebook as one of the world's most popular social networks, but it has a power of its own that goes way beyond just tweeting for fun. The clever developers at CodePlex have managed to create a tiny-but-mighty application called TweetMyPC that allows you to control and access your computer from anywhere in the world by simply sending a tweet with a special command as its content.

You might be used to other kinds of software to remote control your personal computer, but with this tool you can make it even more simple and convenient—tweeting from a smartphone or tablet, for example. Unlike many other remote access programs, such as VNC, an IP address isn't needed. –**CHRISTIAN HALL**

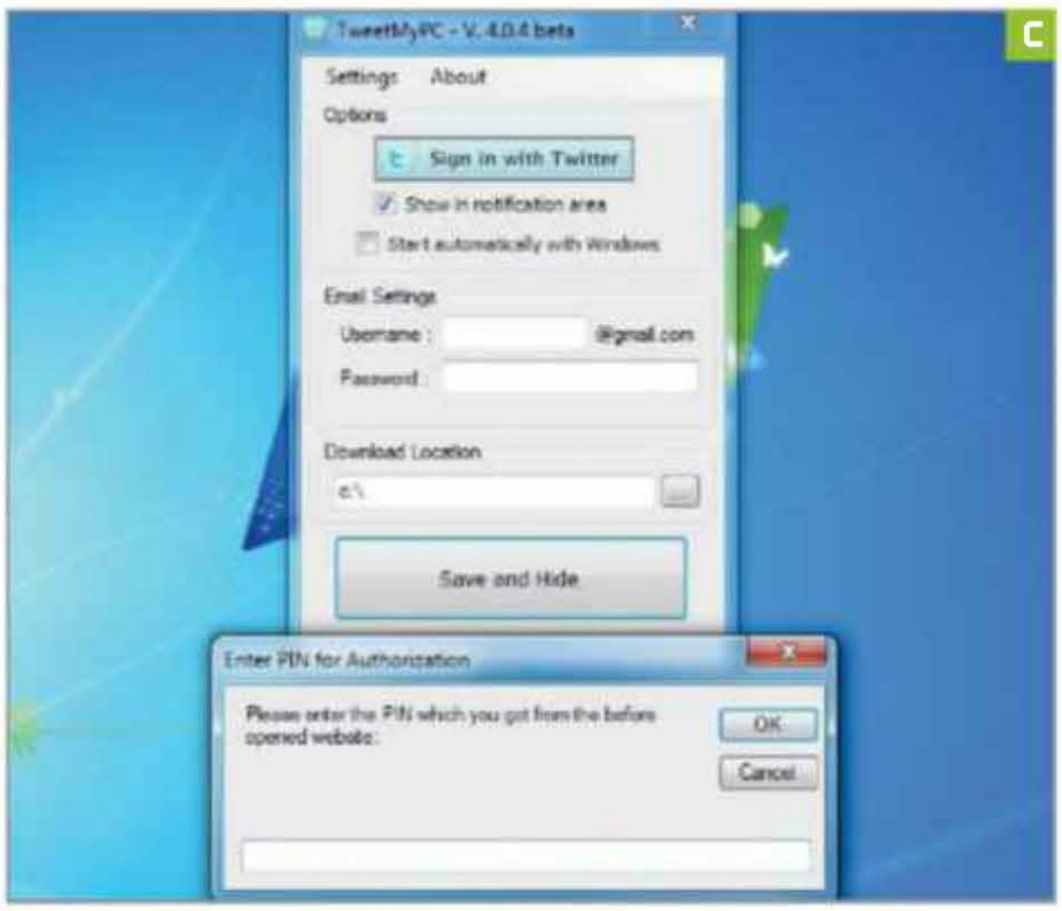
1 CONFIGURE TWEETMYPC To install TweetMyPC, go to http://tweetmypc.codeplex.com. Visit the Download section and download the latest TweetMyPC file. Download it and follow the installation instructions.

» You probably don't want to use TweetMyPC with your primary Twitter account, so go to www.twitter.com and create another account. Make your tweets private by going to Settings > Security and Privacy > Tweet Privacy and selecting "Protect my tweets." After you've finished creating and configuring the account, open up TweetMyPC from your desktop.

» The main window of TweetMyPC will now pop into existence—fill in the required data to link the program to your Twitter account. It's not necessary, but if you don't enter a username and password for a usable Gmail account, then useful commands such as **getprocesslist**, **getfile**, and **getfilelist** cannot be used in the app.

» When you click the "Sign in with Twitter" button at the top, your browser will be redirected to the Twitter site for authentication. Click Authorize and you'll then be shown a unique PIN that you'll need to enter on the pop-up that appears on your desktop (**image C**). Enter the PIN and hit OK. When you're done, click the "Save and Hide" button.

» When signing in, one of the options that appears is "Show in notification area," located just under the "Sign in with Twitter" button. It's selected by default so there's no need to change it. This is handy, as it'll add TweetMyPC to your Windows notification area. You'll get any TweetMyPC-related messages here, too.



C

2 TAKE CONTROL Now, it's time to tell your PC to do something with a simple tweet. From another device, use the Twitter account that's been linked to TweetMyPC to perform a command. Let's start with something simple, such as **ip**, which will display the IP address of your PC. The results will be shown as another tweet on your Twitter timeline (**image D**).

» Next, we can try **powerstate**, which is a useful tweet that will display the current power state of a PC. This also tells you the battery percentage of a laptop, as well as the online status. Now, try **getprocesslist** (Gmail users only), which will list all running programs on your PC. The results are then sent as an email, rather than a tweet (**image E**).

» And that's the basics—you can now control your PC with your Twitter account! You'll find a full list of commands at http://bit.ly/d1Tzz6. Some of these commands include the ability to shut down a PC by tweeting **shutdown**, or updating the wallpaper on your machine by simply tweeting **wallpaper** followed by a URL. Browsing through the list of commands is half the fun, so get started!

D

E

Download Films for Free

YOU'LL NEED THIS

UTORRENT

Pick up the most popular BitTorrent client for free at www.utorrent.com.

YOU HEAR A LOT ABOUT illegal file-sharing and how "torrent" services are to blame, but it's perfectly possible to use them without breaking a single law.

BitTorrent is a legal file-sharing service, and is one of the most efficient ways to get files from the Internet—you just have to know where to look. Whether you're looking for books, music, or videos, there are hundreds of depositories filled with legal downloads for you to enjoy.

If you're into classic movies, there's no better place to start than www.publicdomaintorrents.info. This website hosts content that's in the public domain—typically because the original copyright has expired—and is therefore free and legal for anyone to download. All movies on the site are AVI files encoded in DivX and most of them are around 600MB in size. So let's get downloading!

–CHRISTIAN HALL

1 INSTALL UTORRET The BitTorrent protocol is fast and efficient because it uses many computers (a "swarm") to download lots of file fragments simultaneously. You'll also need a piece of software called a client to assemble these fragments. BitTorrent has its own official client, but we like uTorrent (www.utorrent.com), as it's so easy to use.

» You need to use your router's admin panel to set up a firewall rule for uTorrent (**image F**), otherwise it might be blocked. You need to choose a port number (within a range defined by your router) and set the inbound and outbound status options to Allow. You'll need to enter the primary and secondary DNS settings of your ISP in the appropriate fields, too.

» Some ISPs interfere with file sharing, which causes download speeds to slow. To avoid this, uTorrent has an encryption protocol to prevent ISPs from identifying BitTorrent traffic. Go to Options > Preferences > BitTorrent. Click Protocol Encryption and enable outgoing encryption, then check "Allow incoming legacy connections."

F

2 TWEAK YOUR DOWNLOAD SETTINGS Click Preferences > Bandwidth to set limits for how your BitTorrent client behaves in a swarm. You can define a maximum download and upload rate and choose a maximum number of connections (**image G**). A higher number should mean a faster download, but too many can crash your router. Check online for more router information.

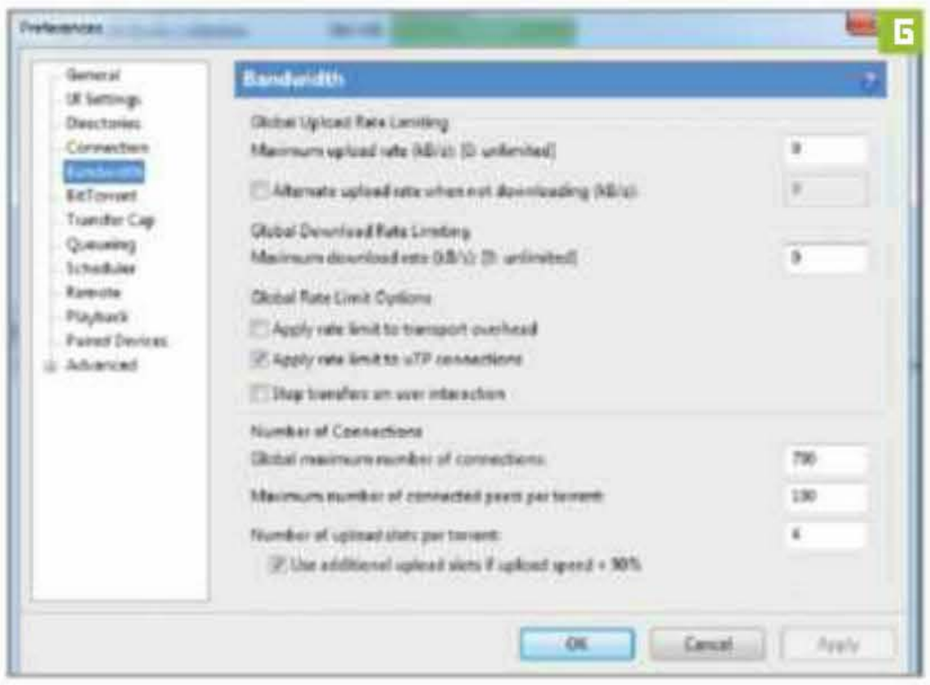
» If you get the downloading bug, you might want to set a download cap on your torrent client so that you don't exceed the monthly download limit set by your ISP. This is easy in uTorrent—just click Preferences > Transfer Cap and enter a value (in gigabytes) that you're comfortable with. You can change this setting at any time.

» If you want to set up your computer so that torrenting behaves in a certain way at a certain time of day, try using the Scheduler option. You'll see a green grid of time blocks that reflects that your uTorrent account is set to operate normally at all times (**image H**). Click each square to change this status to either Limited, Off, or Seeding Only.

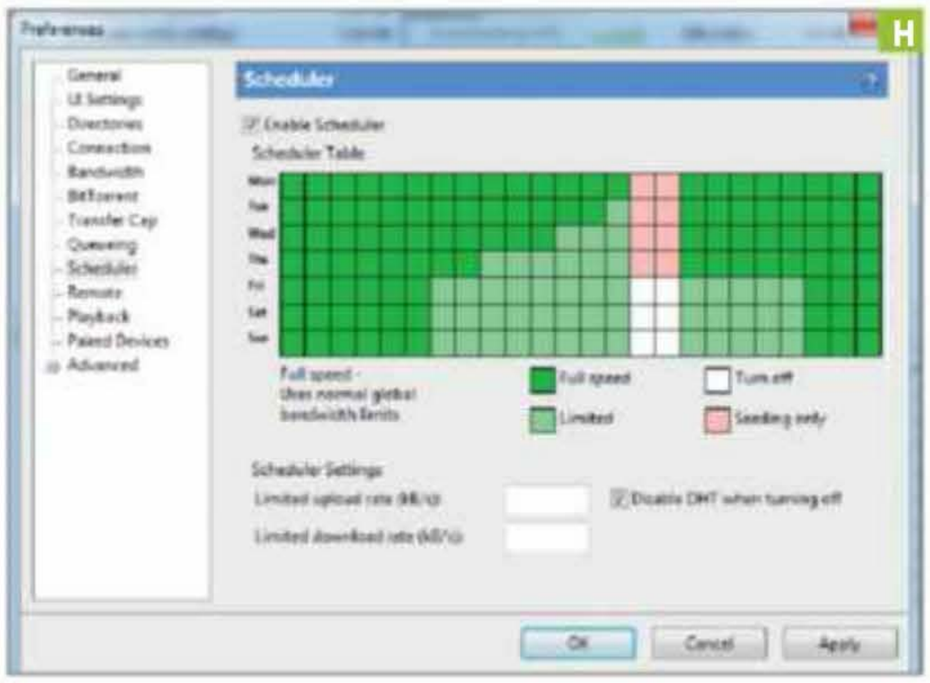
» Now that you've familiarized yourself with uTorrent, you're ready to grab a free film. Find something that interests you at www.publicdomaintorrents.info and click the link. Scroll down and choose a file format (we've chosen DivX AVI). Click the downloaded file to open it with uTorrent and click OK.

» You should find the file downloaded to your chosen destination on your hard drive. The torrent file will also be downloaded somewhere, but you can delete it. The files from Publicdomaintorrents.info are in AVI format and will play using a variety of media players, including Windows Media Player and VLC.

G



H



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BUILD IT

TOM MCNAMARA **ASSOCIATE EDITOR**

Operation Mineral-Oil Submersion

When a custom liquid-cooling system just doesn't feel *Maximum PC* enough, there's only one thing left to do: Submerge the entire computer in liquid

LENGTH OF TIME: **2–4 HOURS**

LEVEL OF DIFFICULTY: **TAKE A WILD GUESS!**

THE MISSION Lately, we've been tossing around the idea of doing a Build It that uses a custom liquid-cooling loop just because they are fun to play with, and when properly designed, have many tangible performance benefits. But since this is *Maximum PC*, we asked ourselves, "Why not take it one step further and submerge *everything* in liquid?" After all, what could possibly go wrong?

You've probably seen aquarium-style case mods like this before, but this time we're taking advantage of a pre-fabbed kit from Puget Systems. It incorporates items that will be familiar to liquid-cooling aficionados, such as a Swiftech pump, compression fittings, and a 240mm radiator. However, what's different is that this kit combines familiar bits with more exotic items, like an acrylic frame/container, an integrated temperature gauge, and the star of the show—several gallons of mineral oil.

Water would kill everything it touches, but mineral oil doesn't conduct electricity and is nonreactive—you can dunk a running power supply into a bucket of the stuff and it will keep running. We'll walk you through the build, detail our mistakes, and show you how it all works. It's not for the faint of heart, but it certainly makes a great conversation piece.

EXPLORATORY DRILLING

THIS ACTUALLY isn't the biggest mineral-oil system Puget offers, as the one we used is designed for microATX motherboards ($445, www.pugetsystems.com). There's a bigger kit that allows an E-ATX board ($690), but we like the fact that this kit requires "only" eight gallons of oil. A single one-gallon jug of the stuff weighs 7.3 pounds, so even this little build will be pushing more than 50 pounds once we're up and running. As you can imagine, this makes the system quite difficult to move around safely. Since our needs included being able to move the system to the photography studio, shuffle it to different ambient temperature ranges for thermal testing, and dangle it over a misbehaving intern's head, we opted for Puget's more manageable mATX option.

Puget does not sell mineral oil directly, but the company is affiliated with STE Oil, which sold us the eight gallons for $160, plus another $180 for three-day shipping (what can we say, we're not the best planners). UPS Ground would have still cost $52, since shipping fees scale according to weight, and shipping 58.4 pounds of anything isn't cheap. So, we recommend you get it locally to save yourself some cheddar.

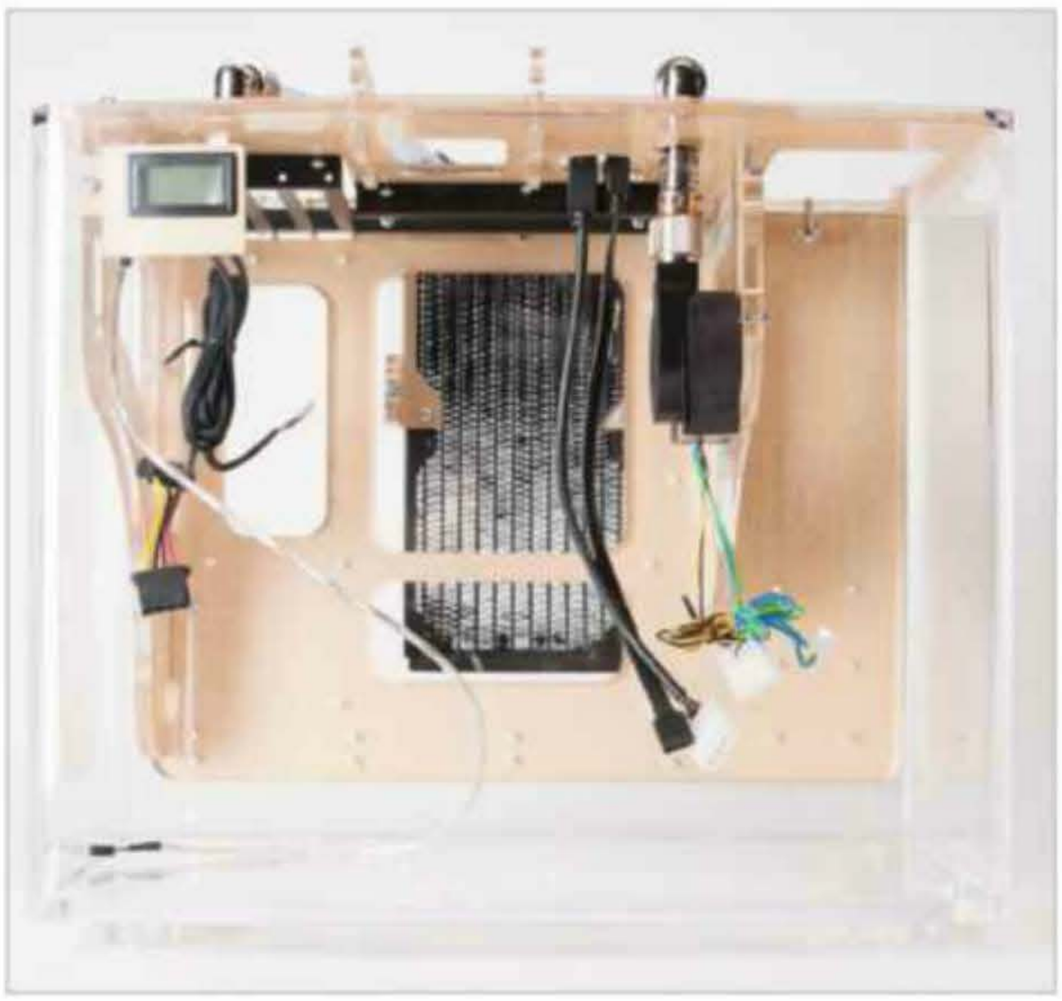
Since this is the first time we've attempted a mineral-oil submersion Build It, we're being conservative with our hardware. We'd rather not destroy expensive gear, and almost all of it is on loan from vendors anyway, so it's not even ours to destroy. Since our build is mediocre, we won't be testing for performance, but instead just seeing how it all fits together, what pitfalls exist, and reporting on temps and whether or not we'd ever do it again. We also hope to produce a PC that looks seriously cool.

1 THE KIT AND KABOODLE

PUGET'S MICROATX kit is made of custom-shaped Plexiglas machined in small batches. It also includes some premium parts, such as a $57 240mm Swiftech radiator, a $100 Swiftech MCP35X pump, several nickel-plated compression fittings, pre-cut tubing, and a thermometer with an LCD readout. Storage devices are mounted on the outside of the thing in order to keep them dry, and the kit includes extension cables and brackets to accommodate that setup. The included documentation is meticulous, and the bags of screws are even color-coded to avoid confusion. The radiator does not come with fans, but you can buy a pack from Puget or bring your own. We chose the latter, pulling some Scythe Gentle Typhoons from our basket of Dream Machine parts.

2 MAKING A CASE

WHEN YOU SEE all the separate components of the case laid out, it looks like it would take days to assemble. In practice, however, the interior rack that holds all the components comes together like Lego pieces, except with screws. The instruction manual has very clear diagrams for every step, leaving little question about what to do next. The case itself is one piece, and the parts you assemble end up with a pair of handles, so when it's all finished, you can carry the assembly via the handles and lift it in and out of the case.



3 GETTING GRAPHIC

SINCE WE intended to test how well mineral oil can dissipate heat compared to air or conventional liquid-cooling systems, we wanted to use some reasonably hot hardware to put the system to the test, and we had exactly that with the triple-slot Asus Radeon HD 7970 DirectCU II GPU. It's as hot as it is huge, measuring 2.25 inches thick and 11 inches long, but Puget's case had no trouble accommodating its length. This GPU gets so hot Asus had to stick a condo-size cooler on it, so we wondered if the oil would be able to handle all the heat this card gives off.

It should, because, in theory, even though the fans will spin more slowly since oil is more viscous than air, the lack of fan movement shouldn't matter since the oil is sucking up the heat given off by the card, and the fans don't play a major role in the cooling loop. Once the oil gets warm, it's pulled out of the case by the pump and sent to the external radiator.

The only thing we didn't like about the GPU setup is that it's across from where the PSU is mounted, so we had to drape the cables through the acrylic case.

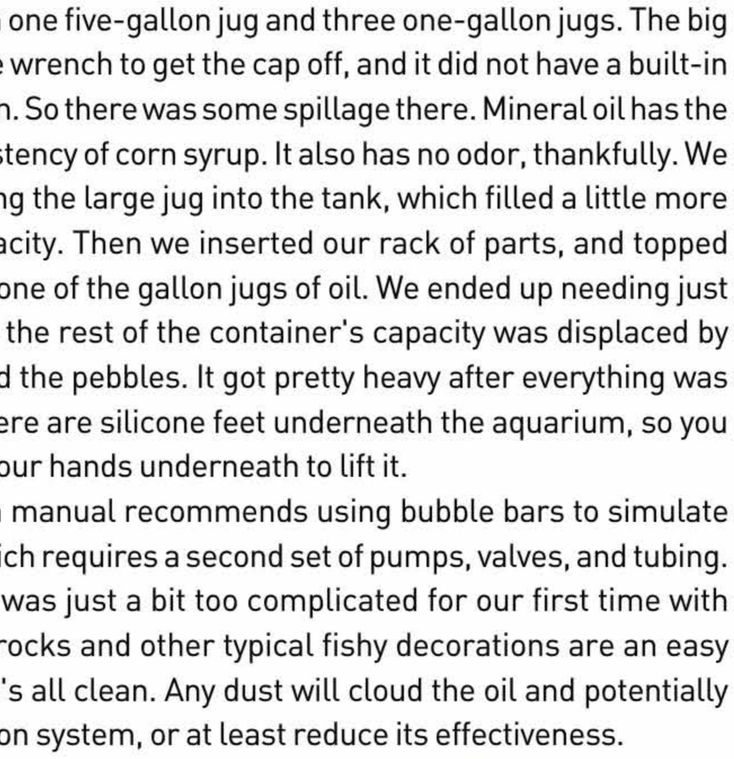
4 PUMPING UP THE VOLUME

THE SWIFTECH MCP35X pump included with this kit is not the standard unit that we used in this year's Dream Machine. It's PWM-controlled, so it can adjust its speeds dynamically according to instructions given by the motherboard that it's plugged into. When the system is idle, the pump operates very quietly. When needed, it can crank up to 4,500rpm, so it's very powerful for its size (and you'll need that extra horsepower to offset the thickness of mineral oil). It also takes standard G1/4 fittings and can directly integrate specific reservoirs, which saves on space. At $100 when purchased separately, it's one of the more expensive pumps you'll find. But our oil-based setup benefits from a pump that has premium features.

5 TAKING A DIP

OUR OIL CAME in one five-gallon jug and three one-gallon jugs. The big jug needed a pipe wrench to get the cap off, and it did not have a built-in tube like a gas can. So there was some spillage there. Mineral oil has the clarity and consistency of corn syrup. It also has no odor, thankfully. We began by emptying the large jug into the tank, which filled a little more than half its capacity. Then we inserted our rack of parts, and topped off the tank with one of the gallon jugs of oil. We ended up needing just six gallons since the rest of the container's capacity was displaced by the hardware and the pebbles. It got pretty heavy after everything was poured in, but there are silicone feet underneath the aquarium, so you can at least get your hands underneath to lift it.

The instruction manual recommends using bubble bars to simulate an aquarium, which requires a second set of pumps, valves, and tubing. We thought that was just a bit too complicated for our first time with mineral oil. But rocks and other typical fishy decorations are an easy add, as long as it's all clean. Any dust will cloud the oil and potentially clog the circulation system, or at least reduce its effectiveness.



6 THE HEAT OF BATTLE

THE PUMP IS JUST one part of the oil circulation system, of course. The Swiftech MCRx20-XP radiator uses brass tubes and copper fins, and a self-purging plenum, which is a chamber that helps maintain equal pressure throughout the loop and can suppress noise. The radiator is hung outside the case on a bracket. It's big enough to fit three fans if you wanted to; one up top and two down below. But the bracket is a bit too bulky to fit four fans, thus eliminating the possibility of a full "push-pull" configuration. The Scythe fans are 120mm units that spin at a fixed 1,850rpm, but they're surprisingly quiet and good at forcing air through a radiator. The fan cables aren't braided, so they're not very pretty. We also needed to add a power distribution block because the motherboard has just one case fan header, and we wanted to minimize the number of cables leading out of the case.

MINERAL OIL DOs AND DON'Ts

1. Mineral-oil submersion will void your hardware warranty.
2. Mineral oil will disintegrate natural rubber in a matter of days, so keep that clear of your tank.
3. Test your tank's integrity by filling it with a few gallons of water first. You do not want mineral oil spillage. Trust us.
4. When pouring the oil in, be aware that it expands as it gets warm. That's why the fill line is several inches below the top of the aquarium.
5. We recommend a large funnel, since the mouths of the oil's shipping containers don't lend themselves to clean pouring.
6. The pump must be submerged in liquid when powered on, or else it will burn out; if you've plugged it into a motherboard fan header, software like HWMonitor will verify the pump's RPMs for you.
7. It can take hours for a mineral oil PC to reach its maximum temp, so your first run will require extended observation.
8. To clean up, you can use nitrile gloves, since they're synthetic rubber, and most cleansers with a degreaser ingredient will take care of spills.
9. While you can disassemble some hardware to clean it for re-use after being in a mineral oil PC, it's highly dangerous to open a power supply, even when it's not plugged in. Take it to a recycling center for disposal instead.

1. The radiator spits out a lot of bubbles when you turn the system on, but it settles down after a minute.

2. We got the curling effect on this cable by winding it around a screwdriver before plugging it in. This makes the cable shorter and easier to route.

3. Puget recommends adding things to the build to simulate an aquarium, so we obliged with aquarium decorations and good ol' Readerman.

4. A twist tie is a simple way to keep spare power supply cables from floating free in the case.

STRIKING OIL

TRYING SOMETHING truly novel in Build It is exciting, but that excitement was tempered by several "oh, crap" moments and hardware failures. For example, it wasn't until all the hardware was dipped into the oil for the first time that we realized we probably should have made sure it at least booted first. Luck was not on our side, and on our first try the machine would not POST. We hoped the issue was related to the monitor, or the monitor cable, or some small thing, but no combination of parts outside the machine had any impact. We did have some luck, in that there was a plastic tub available in the Lab that was large enough to place the oil-soaked rack in temporarily. So we hauled it out and proceeded to methodically replace one part at a time until we got the machine to boot. The problem appeared to be a motherboard fried at some earlier point by static, or physically damaged in a way that's difficult to detect with the naked eye. Once we swapped the board, the system booted right up and remained stable.

The pump was initially a little noisy as it filled up and started circulating oil through the radiator, but the overall acoustics eventually settled down to a gentle whir, even when spinning at a reasonably high 4,500rpm. The loudest element was actually the oil pouring back into the case from the radiator, which was like a pleasantly babbling brook.

Overall temps seemed fine, so we ran FurMark's thermal test for a little while to get some heat into the oil, and the case temperature eventually leveled off at 37 degrees Celsius, comfortably below its rated maximum of 50 C. The Asus HD 7970 stayed around 60 C, though we did have to manually increase fan speed to compensate for the thickness of mineral oil. We found that temps are highly dependent on the fans you use on the radiator; random $5 case fans won't get the kind of result that you will get with $20 Gentle Typhoons (or Corsair SP120s, or Noctua CPU fans), because the higher-end units have a combination of high pressure, high durability, and relatively low noise. We didn't try overclocking the AMD chip, since it was using a stock cooler, and Puget warns against overclocking systems in the oil due to heat concerns.

The radiator fan wires were not long enough to reach the motherboard headers, so we used a power distribution block, which is like a power strip for case fans. You can power them up with Molex, SATA, or PCI Express power cables. The Gentle Typhoons we used spin at a constant RPM, but the noise is low enough that we don't need variable speed PWM control.

Aside from human error, the system itself was a great success. People around the office who aren't even into computers stopped to admire our aquarium PC, with its bubbling liquid and eerie blue glow (provided by a 30cm BitFenix Alchemy Connect LED Strip). It's obviously not for everyone, but if you're looking for a fun DIY project that's "different," it doesn't get much better than this.

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TESTED. REVIEWED. VERDICTIZED.

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DIGITAL STORM AVENTUM II PAGE 74

The Aventum II's case is custom built, not a re-skin of an existing case design.

Digital Storm Aventum II

What's red and faster than Dream Machine? This PC

THERE'S A LITTLE secret in the high-end PC market—few if any of these premium rigs actually have truly unique case enclosures. Instead, most boutique builders start with existing off-the-shelf chassis and customize from there.

The more ambitious OEMs will contract small runs from case companies and tack on a customized façade or logo. Even then, if you look close enough, you'll see their mass-production lineage.

That's not so with Digital Storm's Aventum II. Now in its second iteration, the rig highlights Digital Storm's efforts at creating a truly unique enclosure. Rather than contract for a few thousand semi-custom cases with a slightly different nip or tuck, Digital Storm decided to CAD/CAM its own super-tower from scratch and have it hand-built right here in the US of A. This lets DStorm change the design to suit newer hardware, and boast a case that no one else can have.

The giganourmous Aventum II case is a full four inches deeper than the already-honkin' Corsair 900D and dwarfs just about all other super-towers. With any system, it's not just about the case, though. Details of the components are spelled out in our spec chart, but the highlights include a 3.6GHz Core i7-4960X processor overclocked to 4.7GHz, along with 32GB of DDR3/1866 and a four-way GeForce GTX 780 Ti setup.

If you read our Dream Machine story (September 2013), you know this much hardware is difficult to juice up. We had issues with our 1,600W PSU, and the last two four-way GPU boxes have all had big PSUs, too. DStorm gets around this by integrating two Corsair AX1200i PSUs into the system. That gives the box a combined power reserve of 2,400 watts. With the depth of the Aventum II (about 30 inches) it has enough room to integrate large rads along with the dual PSUs (and yes, peanut gallery, we hear you saying that maybe, just maybe, we should have done this in DM2013, too).

In performance terms, the Aventum II is in good company. Up until now, the Dream Machine has held most of our benchmark records, but that's no longer the case. The Aventum II just squeezes past the 5GHz Core i7-3670X in DM2013 in Premiere Pro CS6 and X264 HD 5.01 performance. It gets trickier on the graphics side—the Aventum II does set a new record in Batman: Arkham City but that's pretty much a CPU benchmark today. In 3DMark11, the Aventum II loses to both DM2013 and the four-way Titan-based Origin PC Genesis that we reviewed in December, by about 10 percent. The reason? DStorm couldn't get water blocks for the 780 Ti in time for our review, as the PCB layout has changed from the Titan's. And on air, the company was sensitive not to offend our acoustic sensibilities since we had just beaten up its loud Bolt PC in our micro-tower roundup (November 2013). Consequently, the Aventum II is as silent as any liquid-cooled system.

So, four-way Titan is better than four-way 780 Ti, right? Nope. We decided to see what the air-cooled 780 Ti cards could do when the librarian wasn't shushing them, so we overclocked the cards by 158MHz and let them push thermals higher. With those settings, we hit 17,840 in 3DMark11, which easily bakes the four-way Titans—even the overclocked Titans—and we're sure 18K would easily be surpassed with another 10 minutes of tweaking. We have some internal figures for Tomb Raider, Hitman, and Unigine 4.0 for DM2013, and the Aventum II easily wins there too, once the noise gloves are off. For the record, it did get a little loud, but not offensively so.

Still, we're torn. It's simply a crime not to have liquid-cooled 780 Tis in this Lust Red box, yet we acknowledge that the option doesn't exist today. And we also have to give Digital Storm props for its truly unique chassis, its digital fan and LED control, and the sheer straight-line speed it has in beating DM2013. As much as we wanted to withhold a Kick Ass from the Aventum II for the lack of liquid-cooled GPUs, we think the rig deserves the honor for being so dedicated to Pure PC Power.

–GORDON MAH UNG

VERDICT

9

KICK ASS!

Digital Storm Aventum II

SUPER TROOPERS Record-breaking performance; unique, giganormic chassis.

STARSHIP TROOPERS Really should have liquid-cooled GPUs; may be too big for some people's homes.

$10,905, www.digitalstorm.com

BENCHMARKS

	ZERO POINT	
Premiere Pro CS6 (sec)	2,317	1,588
Stitch.Efx 2.0 (sec)	760	660
ProShow Producer 5.0 (sec)	1,269	1,189
x264 HD 5.0 (fps)	18.5	26.9
Batman: Arkham City (fps)	99.0	204 (+106%)
3DMark 11	7,050	15,897 (+125%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our current desktop test bed consists of a hexa-core 3.2GHz Core i7-3930K OC'd to 3.8GHz, 8GB of Corsair DDR3/1600, on an Asus Sabertooth X79 motherboard. We are running a GeForce GTX 690, an OCZ Vertex 3 SSD, and 64-bit Windows 7 Professional.

SPECIFICATIONS

Processor	3.6GHz Core i7-4960X overclocked to 4.7GHz
Mobo	Asus Rampage IV Extreme
RAM	32GB DDR3/1866
Graphics	4x GeForce GTX 780 Ti
Storage	480GB Corsair Neutron GTX SSD, 4TB WD Black HDD
Optical	Slot-fed Blu-ray combo
Case / PSU	Custom / 2x Corsair AX1200i

OCZ has updated its flagship Vector with smaller-process NAND and much higher write endurance.

OCZ Vector 150 240GB SSD

A high-endurance Vector arrives

THE SSD WORLD is a bit stale these days, as we all wait for the industry to move beyond the SATA 6Gb/s interface. Most high-end drives have been able to saturate the bus for a while now, so manufacturers have been looking for ways other than performance to differentiate their products from the competition. Though we awarded the original OCZ Vector the vaunted Kick Ass award, the drive came out of the gate as one of the most expensive SSDs available, and the price never really dropped much over the past year. Sure, it's smokin' fast, but $300 for a 256GB SSD is too much, considering its competition is just as fast and less expensive. OCZ has addressed this problem by moving to a smaller, more-efficient process for its NAND, switching from 25nm Intel/Micron IMFT chips to 19nm Toshiba modules. These bits of ToshMLC NAND are popular and have a solid reputation, as shown by their usage in the Corsair Neutron GTX and the Seagate 600 SSDs. OCZ also increased the drive's write endurance to a torrent-loving 50GB a day, up from 20GB on the original Vector.

Since this is a flagship SSD, it comes with a five-year warranty. It's available in 120GB, 240GB, and 480GB capacities. You'll note the rounded-off capacities due to overprovisioning, which is also a change from the original model, which came in 128GB, 256GB, and 512GB capacities. Finally, OCZ has added full-disk 256-bit AES encryption this time around, which is also an upgrade from the OG Vector. The drive uses the same all-metal 7mm chassis as the original model, and includes a 3.5-inch bay adapter as well as a copy of Acronis True Image hard-drive cloning software, so you can easily clone your old drive to your new SSD.

This new Vector 150 uses the same Barefoot 3 drive found in the original Vector, and it's still able to run with the big boys of the SSD world, of which the Vector is a card-carrying member. To be clear, we consider all the SSDs with a five-year warranty to be "enthusiast" drives, whereas three-year warranty drives are merely "consumer." That aside, the new Vector is just as impressive as the previous model, meaning it's one of the fastest SSDs available. In testing, it matched the Samsung 840 Pro and the SanDisk Extreme II in sequential read and write tests, where it is saturating the SATA 6Gb/s interface. It didn't really care if data was compressed or not, and was able to chug through them regardless. It achieved the second-best score ever in our Sony Vegas 20GB write test and also was top of the charts in PC Mark Vantage, although its score of 71,125 IOPS in Iometer, while respectable, was not near as fast as we've seen.

All in all, the pattern is quite clear. This is an SSD that's very strong across the board. We like the drive's increased endurance, but would need a year to test it, so we'll have to take OCZ's word for now. We love the software bundle too, though its OCZ Toolbox is still rough around the edges. While we do think the drive is a bit too expensive, it's otherwise top-notch. **–JOSH NOREM**

VERDICT 9 KICK ASS!

OCZ Vector 150 240GB SSD

VICTOR Superb bundle; five-year warranty; top-notch performance; extreme endurance.

LOSER OCZ Toolbox is bush league; too expensive (just barely).

$240, www.ocz.com

BENCHMARKS

	OCZ Vector 150	OCZ Vector	Samsung 840 Pro	SanDisk Extreme II	Corsair Neutron GTX
Controller	Barefoot 3	Barefoot 3	MDX	Marvel Monet	LAMD
Capacity	240GB	256GB	256GB	500GB	240GB
CrystalDiskMark					
Avg. Sustained Read (MB/s)	515	497	524	**534**	513
Avg. Sustained Write (MB/s)	497	496	497	**503**	434
AS SSD					
Compressed Read (MB/s)	502	502	**513**	510	504
Compressed Write (MB/s)	491	492	**495**	478	433
ATTO					
64KB File Read (MB/s)	**532**	522	524	528	527
64KB File Write (MB/s, 4QD)	480	**541**	497	398	445
Iometer					
4KB Random Write 32QD (IOPS)	71,125	80,015	**89,297**	43,558	81,068
PCMark Vantage x64	74,595	74,005	75,205	**76,358**	42,211
Sony Vegas Pro 9 Write (sec)	276	307	294	**273**	358

Best scores are bolded. All tests conducted on our hard drive test bench, which consists of a Gigabyte Z77X-UP4 motherboard, Intel Core i5-3470 3.2GHz CPU, 8GB of RAM, Intel 520 Series SSD, and a Cooler Master 450W power supply.

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HP's Chromebook 11 takes the prize for the most stylish Chromebook we've seen.

The Acer C720 is plain, but she has it where it counts. No, really, she does.

Clash of the Chromebooks

ARM and Haswell do battle

You knew x86 Haswell would eventually face off against ARM, but you probably didn't expect the fight to go down in Google's thin-client-esque Chrome OS. Yet that's what we have as we pit HP's new COS-based lappy against Acer's second-gen Chromebook. Obviously, at *Maximum PC* we're acutely aware of the Chrome OS's limitations, but that doesn't stop us from telling you which is the top Chromebook today. **–GORDON MAH UNG**

HEWLETT PACKARD CHROMEBOOK 11

Besides the original CR-48 and Google's Pixel, Chromebooks haven't exactly been known for their style. In fact, many people could confuse them with escapees from Netbook Island.

Not so when it comes to HP's new Chromebook 11. HP seems to have pulled a Cleo McDowell and made off with Apple's 1990s operations manual. The Chromebook 11 borrows the Apple-of-yore white plastic and rounded edges, and then tosses in an accent color (in our case, blue) for good measure. While the externals of the Chromebook 11 are pleasing, the internals are decidedly old. The Chromebook 11 features a Samsung dual-core 1.7GHz Exynos 5 ARM processor, the same chip that was used in the Samsung Chromebook we reviewed in January 2013. In performance, it's not old-Atom atrocious. In fact, it can handle most light-to-medium chores that have the Atom-based CR-48 showing its age.

True, this is the limited-functionality Chrome OS—it's not like you'll be firing up too many heavy hitters on it. Still, you can bog down the Chromebook 11's chip far easier than the Haswell proc in Acer's Haswell-based C720. If it wasn't for the C720, in fact, we'd probably actually think the Chromebook 11's performance was acceptable for limited uses. But the fact is, the C720 spanks the Chromebook 11 so hard, it could charge for it.

In one test, we tried to simulate a multitasking load by starting Google Music, playing a 1080p video on YouTube, opening a Flash-based Gigapixel image browser, opening a tab for Amazon and a tab for Google Maps, running a WebGL app, and then finally running the Kraken benchmark. Guess which lost? (Hint: It wasn't Haswell.) To be fair to the Chromebook 11, the performance of the 1.7GHz Exynos 5 actually surprised us. It's somewhat competitive with Chromebooks based on the Celeron 847 and even gave a Microsoft Surface Pro running Chrome and Windows 8.1 a good scare when the latter's Ivy Bridge CPU is set to Power Saving mode. We can't help but compare the HP to the Acer C720, though. The Acer is simply more responsive and doesn't exhibit the same sluggishness as the Chromebook 11 under heavier multitasking loads.

Surely the ARM part dishes payback in run time though, right? Not necessarily. Remember, you can't just compare the chips without taking into account all of the other hardware around them. What we can say is that the Chromebook 11 battery life is OK. It's certainly better than the Google Pixel and the Acer C710 with its Sandy Bridge-based Celeron. It's oddly worse than the Samsung ARM Chromebook, which has the same SoC and battery size. What it can't do is touch the Acer C720, which hammers six hours of use.

What does this all add up to? The Chromebook 11 has some very nice touches. The IPS screen (unheard of in sub-$300 laptops) is gorgeous, its keyboard is better than the C720's, it's lighter and easy on the eyes. Oh, and did we mention that you can charge it using microUSB? Sure, you have to use a beefy 3-amp charger, but the same charger can also charge your phone (unless you roll Apple hardware). Despite that, we wouldn't take this over the performance, battery life, and price advantage the C720 has. Sorry, looks just ain't everything.

VERDICT **7**

Hewlett Packard Chromebook 11

$280, www.hp.com

BENCHMARKS

	HP Chromebook 11	Acer C720	Google Pixel	Acer C710	Samsung Chromebook	Google CR-48	Microsoft Surface Pro
CPU	Dual-core 1.7GHz Samsung Exynos 5	Dual-core 1.4GHz Celeron 2955U Haswell	Dual-core 1.8GHz Core i5-3337U Ivy Bridge	Dual-core 1.1GHz Celeron 847 Sandy Bridge	Dual-core 1.7GHz Samsung Exynos 5	Single-core + HT 1.66GHz Intel Atom N455	Dual-core Core i5-3317U Ivy Bridge
RAM / Type	2GB DDR3	4GB DDR3 LP	4GB DDR3/1600	2GB DDR3	2GB	2GB DDR3/1333	4GB DDR3/1600
Storage	16GB SSD	16GB SSD	64GB SSD	16GB SSD	16GB SSD	16GB SSD	64GB SSD
Display Res / Type	11.6-inch 1366x768 IPS	11.6-inch 1366x768 TN	12.85-inch 2560x1700 IPS	11.6-inch 1366x768 TN	11.6-inch 1366x768 TN	12.1-inch 1280x800 TN	10.6-inch 1920x1080 IPS
GPU	Samsung Mali-T604	Intel HD	Intel HD4000	Intel HD Graphics	Samsung Mali-T604	Intel GMA3150	Intel HD4000
Weight	2.3 lbs	2.76 lbs	3.35 lbs	3 lbs	2.43 lbs	3.8 lbs	2 lbs
Street Price	$280	$250	$1,500	$250	$250	N/A	$700
SunSpider JavaScript 0.9.1 (ms)	697.3	347.9	**319.6**	570.0	698.9	1,578	664.47
Google Octane V1	5,286	10,158	**15,688**	5,832	5,050	2,551	6,532
FutureMark Peacekeeper	1,110	2,931	**3,496**	1,391	1,117	509	1,272
BrowserMark 2.0	2,845	4,553	**4,796**	3,366	2,898	1,950	2,826
Kraken 1.1 (ms)	5,264	2,704.8	**2,432**	4,337	5,099	11,976	5,253.1
Wirple	196	1,050	**1,165**	262	207	75	275
GUIMark 2 Bitmap Game Test—Flash 10 (fps)	12.83	**20.67**	13.06	12.47	12.76	5.47	19.07
RoboHornet Alpha RH-A1	59.20	108.15	**124.11**	66.97	57.55	31.48	70.12
Battery Run Down (min)	241	**360**	200	195	283	N/A	203

Best scores are bolded.

ACER C720

You know how boring the Acer C720 looks? It's so bland that your tech-toting buddy will ask you to fly wingman at the café so his new notebook can stand out next to your boring-ass Chromebook. What's surprising about this physically unremarkable device, however, is that it's damn near the best Chromebook out today.

First up: The C720 fixes the major problem we had with the Acer C710 (reviewed Holiday 2013), which featured power and cursor buttons that were so small they could only be actuated by that grocery store cashier with the 2.5-inch Lee Press-on Nails. The keyboard is also now the familiar standard Chromebook keyboard layout—integrated power key, dedicated search key, no Caps Lock.

Most of the improvements are inside, though. The C720 uses Intel's brand-new 1.4GHz Celeron 2955U chip. That's a dual-core CPU with Hyper-Threading, based on the latest Haswell microarchitecture. We know performance doesn't matter as much in a Chromebook, but wouldn't you like to be able to have 10 tabs open and pointed at great big, fat websites and not have your browser so bogged down it is crippled by a Flash ad? That's what happens with the HP Chromebook 11 in any power-browsing scenario. Not with the Acer C720, which in our testing is almost as fast as the Core i5 Ivy Bridge–based Google Pixel.

In fact, in browser performance, the $250 Acer C720 is actually faster than the Core i5–based Microsoft Surface Pro in most tests when the latter is in Power Saving mode. The real icing on this Chromebook cake is the battery life. The notebook is rated for 8.5 hours of use. We didn't get that much, but our run test—a continually looping FutureMark Peacekeeper browser test—is probably far more CPU- and graphics-intensive than most average browsing sessions, so 8.5 hours is likely attainable but, as always, your mileage may vary.

The HP Chromebook 11 tapped out at 241 minutes, the Google Pixel ran out of gas at 200 minutes, and the Surface Pro blew a motivator at 203 minutes. The Acer C720 didn't shut down until 360 minutes. That's more than enough to make a transcontinental flight, and a nice improvement when you consider that the Acer C710 is on vapor at 195 minutes. We won't give all of the credit to Haswell, as we think the bigger battery and likely other hardware choices also play a part.

Not all is perfect with the C720, however. Besides its uninspired looks, the TN screen is downright blah—especially next to the HP Chromebook 11's IPS panel. It's not horrible off axis, but the low contrast ratio and overall bluish tone of the screen didn't make our eyes happy for long stretches. One thing we do like though, is the use of an anti-reflective coating on the screen. While media playback and gaming might favor glossy screens, browsing is best without glare, and since we think most of what we'll do with a Chromebook is browse, the matte finish is preferable.

Despite its shortcomings, Acer's C720 still stands above the pack. If it had a better-quality panel, we could certainly see it receiving a Kick Ass award.

Acer C720

$250, www.acer.com

The Alienware 17 offers a plethora of LED customization options.

Alienware 17

A gamer's laptop through and through

TECHNICALLY, THERE'S NO real definition for a "gaming laptop." While it's generally considered a notebook with a discrete graphics card, sometimes it can feel like the GPU was slapped in as an afterthought. The Alienware 17, however, feels like it was meticulously crafted to be a *true* gaming machine from top to bottom.

The Alienware 17 uses a similar chassis to the Alienware 14 we reviewed in December, with the same anodized aluminum shell and magnesium-alloy frame, only enlarged to 16.2x11.7x1.9 inches in order to fit a bigger 17.3-inch display. Unlike its smaller sibling, the Alienware 17 isn't designed for gaming on the go, and is more of a desktop replacement, with a carry weight of 11 pounds, 7.6 ounces. The sturdy chassis houses a 1920x1080 TN panel, which is great for gaming with its fast response time, but we still would have preferred an IPS screen for more vivid and accurate colors. In addition, we dare say the Alienware 17's Klipsch speakers are among the best we've heard on a laptop, being both loud and crisp.

Another similarity between this and the 14-inch model is the use of the Alienware Command Center software suite, which allows you to customize 10 LED lights around the chassis with any of 20 different colors, making for more than 10 trillion lighting combinations, according to Alienware. There's no mistaking this for anything but a gaming laptop, and thankfully the overall aesthetic is more sexy than gaudy.

Luckily, the Alienware 17 not only looks great, but feels great, too. Its large body allows it to sport a full-size keyboard, complete with four programmable keys. Typing feels good, as the keyboard sits atop an aluminum plate, which itself sits atop a metal stud to add extra rigidity and all but eliminate the mushiness and flexing that laptop keyboards can have. And finally, we have a trackpad that's competent! It's responsive, has two separate, dedicated buttons, supports multitouch, and even has a glowing LED underneath it. Attention, other laptop vendors: *This* is how you make a trackpad.

The most noteworthy features, however, are the specs. Our Alienware 17 configuration sports a top-of-the-line GeForce GTX 780M GPU with 4GB of GDDR5 RAM, a quad-core Intel Core i7-4800MQ quad-core CPU clocked at 2.7GHz (that can turbo up to 3.7 GHz), and 16GB of DDR3 RAM. It also comes with a 256GB SSD, a 750GB HDD, and a speedy Killer AC network card. Other than a super-beefy hard drive, it really has all the muscle you'll need from a gaming laptop, but it comes at a cost—specifically, a whopping $2,750. Ouch! If performance is your mantra, however, the Alienware 17 has got it.

This month, we decided to update our gaming-laptop zero-point from a 2012 MSI GT60, which uses an older Ivy Bridge CPU and outdated GeForce 670M GPU, to Alienware's new 14-inch offering. Yes, that means we've got a little sibling rivalry here. And just like real-life siblings, the bigger Alienware 17 pushes around its kid brother, the Alienware 14, pretty much everywhere. The 17's Haswell processor was able to wallop the 14's Core i7-4700MQ part by 4–8 percent in our CPU benchmarks, but the real kick in the pants came in our new BioShock Infinite and Metro: Last Light GPU benchmarks. While the 14's 765M GPU is no pushover, it can't hold a candle to the 17's 780M video card, and lost by 75-100 percent in our graphics tests. The only area where the Alienware 14 was able to hold its own was the battery performance, mustering a 28 percent lead. That's the problem with big brothers: They can throw heavy haymakers but they tire quickly.

In our real-world gameplay test, we fired up the single-player campaigns for both Call of Duty: Ghosts and Battlefield 4. At max settings in Ghosts, we were able to yield an average frame rate in the 60s. In Battlefield 4 at Ultra settings, we got a consistent frame rate in the 40s. While that's impressive for a notebook and technically playable, we would suggest turning down settings for an even higher frame rate. Arguably, the worst part about gaming on the 17 is that its fan can get pretty loud under load. It's no leaf blower, but it's definitely audible.

The Alienware 17 has a lot going for it in terms of aesthetics, build quality, and performance, but it's also noisy, expensive, and really should come with an IPS panel at its price point. But if you can forgive those issues and are looking for a true gaming notebook, the Alienware 17 has you covered. –JIMMY THANG

BENCHMARKS

	ZERO POINT	
Stitch.Efx 2.0 (sec)	962	898
ProShow Producer 5 (sec)	1,629	1,513
x264 HD 5.0	13.5	14
BioShock Infinite (fps)	36.1	71.9
Metro Last Light (fps)	30.4	61.3 (+101.6%)
3DMark 11 Perf	4,170	7,294
Battery Life (min)	234	167 (-28.6%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our zero-point notebook is an Alienware 14 with a 2.4GHz Intel Core i7-4700MQ, 16GB DDR3/1600, 256GB SSD, 750GB 5,400rpm HDD, and a GeForce GTX 765M. BioShock Infinite tested at 1920x1080 with Ultra settings. Metro: Last Light tested at 1920x1080 with medium settings and PhysX disabled.

VERDICT 8

Alienware 17

ALIEN (1979) Powerful; customizable LED lights; good keyboard and trackpad; high-quality chassis.

ALIEN RESURRECTION (1997) Expensive; poor battery life; heavy; TN panel; loud fan.

$2,750, www.alienware.com

SPECIFICATIONS

CPU	2.7GHz Intel Core i7-4800MQ
RAM	16GB DDR3/1600
Chipset	Intel HM87
GPU	Nvidia GTX 780M
Display	17.3-inch, 1920x1080 TN display
Storage	750GB 7,200rpm HDD, 256GB SSD
Optical Drive	Slot-loading Blu-ray burner
Connectivity	Ethernet, HDMI, Mini DisplayPort, media card reader, 4x USB 3.0, mic input, headphone input, mic/headphone input, 2MP webcam, Bluetooth 4.0, 802.11ac
Lap / Carry	9 lbs, 5.8 oz / 11 lbs, 7.6 oz

Windows 8.1 and an x86 processor don't hold the T100 back when it comes to battery life.

Asus Transformer Book T100

A lot of value in a little package

LOOKING AT MICROSOFT'S hardware model, you might think that all Windows tablet/laptop hybrids fall into one of two camps: capable-but-pricey, à la the Surface 2 Pro, or the opposite of that, i.e., the ARM-toting, Windows RT–sporting Surface 2. Luckily, not all PC manufacturers see things so black-and-white. Hence we have the Asus Transformer Book T100, which not only offers Intel's new x86 Bay Trail Atom processor and a full version of Windows 8.1, but is also priced at an affordable $400 for the 64GB model reviewed here ($350 for the 32GB). Shoot, an ARM-based Surface 2 with 64GB of storage costs $550! And that's with the funky, fuzzy, flat TouchCover keyboard. That makes the T100 a compelling value proposition, to be sure. But we wanted to know how this combination tablet/laptop fares in actual use.

Given the price, it shouldn't be too surprising that the T100's construction is largely plastic—shiny gray plastic on the back of the tablet, matte plastic on the front and back of the keyboard dock—but all parts feel solid. To form a clamshell, you line up the bottom of the tablet with two guideposts at the back of the keyboard dock and then click the screen in place. The process takes little effort.

In its laptop state, the T100 weighs two pounds, seven ounces (not counting the power brick, which adds a mere 2.5 ounces) and measures a little less than an inch thick. The weight between the tablet and dock is pretty evenly distributed, as opposed to the top-heavy nature of some other hybrids.

Port selection is modest—Micro HDMI, Micro USB, Micro SD, and headphone/mic jack on the right-hand edge of the tablet, and a lone USB 3.0 port on the left side of dock—but all your basic needs are covered. A power button lives on the top of the screen, with a volume rocker and Start button on the screen's left edge—all are thin and reside on the curved edge of the chassis, which we found to be a bit awkward.

You might look at this compact clamshell and think "netbook," but the T100's performance says otherwise. The Bay Trail chip is vastly superior to the underpowered Atoms that were found in the likes of Asus's Eee PC and others of that era. Whether we were opening consecutive web pages, Working in Google Docs, or watching 1080p YouTube video, the T100 felt capable and responsive. Still, it's not in the same league as, say, a Haswell-based machine, so we looked to the Surface 2 as a zero-point in our benchmarks. The Surface 2 is based on the Tegra 4—one of the newer, faster ARM processors available today running four Coretex-A15 cores. Running browser-based benchmarks in the same version of Internet Explorer on each machine, we found the two to be pretty on par. That is, except in our test where we open multiple websites, including a 1080p YouTube video, Google Maps in satellite view, and Space Goo's WebGL Solar System, while running the Kraken benchmark. Here, the T100 ran laps around the Surface 2.

Granted, full-on Windows applications, these are not. When we ran our standard laptop Photoshop test, the T100 was more than three times slower than Lenovo's ThinkPad Helix, which sports a Core i5 but also cost four times as much. It might be just as well, since using the T100's keyboard for any serious productivity would be pure madness. The keys are just far too small for extended use, and the small trackpad is similarly lacking.

The 1366x768 screen is a little low-res by current standards, but we found the IPS panel to be satisfying with most any content. This, along with the decent power of the speakers and a phenomenal battery life (after running FutureMark Peacekeeper's battery test for eight hours, there was still 25 percent battery remaining!) make the T100 a pretty nice tablet.

So in the end, it's hard not to see the highly versatile Transformer T100 as a good deal. Just don't have any expectations of it taking the place of a real laptop.

–KATHERINE STEVENSON

VERDICT **7**

Asus Transformer Book T100

AUTOBOT Win8.1 and x86 for $400; nice IPS screen; excellent battery life.

DECEPTICON Aggravating keyboard/trackpad; charging through Micro USB takes hours.

$400 for 64GB ($349 for 32GB), www.asus.com

BENCHMARKS

	ZERO POINT	
SunSpider JavaScript 0.9.1 (ms)	396.9	420.2 (-5.5%)
RoboHornet Alpha RH-A1 (ms)	45.3	47.8 (-5.3%)
Google Octane V1	3,622	3,606 (-0.4%)
Multitasking w/Kraken ms)	20,703.7	9,941.1 (+108.3%)
FutureMark Peacekeeper	763	725 (-5%)
Battery Life (min)	225	480 (+113.3%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our zero-point is a Microsoft Surface 2 with a 1.7GHz Tegra 4 quad-core CPU, 2GB RAM, 64GB flash storage, and Windows RT 8.1.

SPECIFICATIONS

CPU	1.33GHz quad-core Bay Trail-T Z3740
RAM	2GB DDR3/1600 dual-channel
Display	10.1-inch 1366x768 IPS LCD
Storage	64GB eMMC
Ports	Micro HDMI, Micro USB, Micro SD, headphone/mic jack
Lap / Carry	Laptop: 2 lbs, 7 oz / 2 lbs, 9.5 oz; tablet only: 1 lb, 4.1 oz

There's a $50 million bounty on Batman's head, which apparently doesn't need to remain attached to his body.

Batman: Arkham Origins

Rocksteady proves a hard act to follow

IN 2009, EXPECTATIONS for Batman: Arkham Asylum were not high, since movie tie-in games have a pretty sketchy track record. Developer Rocksteady was also relatively unknown back then, and Christopher Nolan's Batman films had become landmark cinema, making them a hard act to follow even for celebrated game designers. But this determined gang delivered a faithful and entertaining romp (having the talented voice actors from the cartoons take on their roles didn't hurt, either). Fast-forward to 2013, and an unrelated, newly formed studio is at the helm—and Batman and Joker have new voices. We also have potentially tacked-on multiplayer now. It sounds like cause for concern once again, and this time the worries are more justifiable, though not in the ways you might expect.

The gameplay is largely unchanged. Batman still glides and grappling-hooks his way over the gritty, crime-infested streets of Gotham, overhearing conversations and finding collectibles. You still beat the snot out of hundreds of thugs using the same combo system. You get a smaller window to respond to an attack, so your combo chains are broken more often, which makes the truly interesting maneuvers less accessible. The more time you spend evading, the longer the fight takes. Toward the end of the main storyline, you will be fighting literally dozens of dudes at once, all with differing abilities and tactics. It can be downright grueling sometimes.

Speaking of the story, it's also not as tight. Though you have a $50 million bounty on your head, and eight or so assassins are after it, you largely have the city to yourself, unless you decide to confront them. Four of them are optional, or you can deal with them after the main plot has concluded. On the other hand, defeating the assassins unlocks certain combat abilities. But other than that, they don't actually try to hunt you down or lure you in. You don't have to worry about innocents getting caught in the crossfire, because ordinary citizens are nonexistent. They've apparently barricaded themselves in after hearing about this $50M scavenger hunt, and there's also something about martial law, but you don't see any police or military personnel patrolling the streets.

One can't help but wonder what might have been if developer Warner Brothers Montreal had not divided its efforts between single-player and multiplayer. The latter is a novel experience: Two teams of thugs must fight off Batman and Robin while fighting each other for territory. But the two hero characters are largely vertical attackers, so someone playing a gang member is getting attacked from all angles, making death frequent and frustrating.

Aside from multiplayer, the overall sense of déjà vu throughout Origins is so regular that the game feels more like a game-length flashback set within the previous installment, rather than a distinct experience. Granted, Origins is modeled after the very satisfying experience of the previous game, Arkham City, so it never strays into the outright regrettable. But it never fully emerges from that long shadow, either.

–TOM MCNAMARA

VERDICT **7**

Batman: Arkham Origins

JIMMY OLSEN Continues a proven model of gratuitous face-kicking and high production values.

MATTER EATER LAD Feels like super-sized DLC; story not as tight; combat is less satisfying.

$50, www.batmanarkhamorigins.com, ESRB: T

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MATURE 17+ M CONTENT RATED BY ESRB

No, this isn't a trailer for *Gravity*. Yes, you can apparently go Rambo on a person (or an installation) in space.

Call of Duty: Ghosts

Immaterial, indeed

TALK ABOUT a disappointing ghost.

We don't mean the holes-cut-in-a-sheet, Charlie Brown–style Halloween-costume-gone-awry. That actually sounds pretty fun. We're talking about the weird, ski-mask-wearing group of quote-unquote stealth operatives who personify Infinity Ward's newest title in the Call of Duty franchise—you know, those guys wearing the spooky logo over their faces who look as if the developers read a bit too much *Punisher* during crunch time.

We'll give Infinity Ward credit: It's trying just about everything it can to spice up Call of Duty: Ghosts, the first double-digit entry in the 10-year franchise. But we can't help but wonder if it wouldn't have been a wiser decision for the group to kill the series while it was on top.

Why's that? We got bored.

First, an explanation. When reviewing games at *Maximum PC*, we do our best to stick with a title all the way through to the bitter end. Rare is the game where we find ourselves ready to "verdictize" after a shorter timeframe, but Call of Duty: Ghosts is just that special, skull-emblazoned snowflake. Right around mission seven of the game's 18-mission single-player campaign, we were ready to call it quits.

It's not that the campaign is poorly constructed, per se; it's very Call of Duty, for better or worse. You, Logan, warp through time and space (literally, though you play as someone else during your little *Gravity*-like trip through the heavens) in your somewhat-clandestine attempts to stop a superpower called the Federation (really?) from winning a land war against the good ol' US of A. You hang with your brother and his dog a lot; you meet up with some of the "ghosts" you've oh-so-heard about; and you quickly acquire, lose, and re-acquire the Federation's main bad guy.

It's not that the story isn't exciting on its face; it's the way it's delivered—and the gameplay. We find it quite disjointing the way Infinity Ward sometimes treats the plot. For example, you start out at home, 10 years prior to the main storyline, trying to avoid the sweet kiss of death while your town gets blasted by the space-based weapons platform ODIN. You then warp to said platform, 15 minutes earlier, to take up the role of Random Astronaut Guy (or girl) who is attempting to stop the evil Federation from taking control.

The thing is, you already know how this brief spurt of weightless combat ends, which makes the entire exercise seem a bit moot. While your astronaut burns up in the atmosphere, you warp back down into the perspective of Logan once again. You escape death, flash-forward 10 years, and the story churns forward through a *Butterfly Effect*–like smorgasbord of times and locations. The adventure can, at times, feel a wee bit schizophrenic.

Infinity Ward does sprinkle in some intriguing gameplay elements—tried-and-true as they might be—to spice up Ghosts' extremely linear action. Sometimes, you get a fun weapon to play with (we do love rockets). Other times, you're controlling a remote sniper rifle or an A-10 Tank Killer (somewhat fun). You even get a chance to control your freakin' dog companion, which officially wins this year's award for "least believable in real life" element of a military-themed shooter.

However, these little moments feel more like the palate-cleansing cracker between a series of banal courses. They're hardly engaging or challenging—at one point, we watched enemy fighters run out of nowhere to stand, stiff as flagpoles, in nearly the exact

Let's get physical! Physical!

spots where we had just remote-shot their peers. Gripping AI there, Infinity Ward.

And if you think anything changes in Ghosts' pew-pew gunfight parts, you're mistaken. The game's linear routing turns most gunfights into an Old Western–style "cover, pop up, and blast to pieces" kind of a fracas. Even playing on the game's second-highest difficulty setting, Hardened, we only found ourselves dying from the occasional misstep related to running away from grenades. As far as bullets go, there was absolutely nothing that our red-dot weaponry couldn't handle—our weapon, our patience, and, when we got bored, our dog.

For a game that practically screams "shooter Assassins Creed" on its cover, we feel that it lacks some of the core, stealth mechanics that one might find in a game with the word "Ghosts" right in the title. They exist a little bit, sure, but this isn't a Far Cry 3 kind of a deal where you spend agonizing minutes plotting your way through an enemy encampment in such a fashion as to cause maximum carnage with minimal chance of alarm-raising. The "stealth" bits of Ghosts are predominantly event-based and, to us, feel overly simple, if not few and far between.

Infinity Ward has almost become too *good* at the Call of Duty formula, we'd argue; we'd also give just about anything for a little more variety in the actual construction of the individual missions themselves. The setups, situations, and scenery are all lovely and beautifully presented, but it's hard to feel like you're doing much more than taking part in a giant shooting gallery most of the time. The exciting add-ons Infinity Ward tosses into Ghosts—brief tank combat, any-one?—can't carry the game on their own.

Of course, it's also arguable that most people buy Call of Duty titles nowadays for the multiplayer, not the single-player campaign. This time around, Infinity Ward packs three different variations into the multiplayer version of the game—two too many.

The standard Call of Duty slugfest serves as the game's multiplayer core, for better or worse. Yes, the maps are still horribly imbalanced in a "spawn and die within seconds" kind of a way, which hampers much of the strategy one might otherwise want to employ when shooting one's peers. A plethora of different game modes opens up your creative options a bit, but they're all very shooter-driven—ain't no base-assaulting in Call of Duty: Ghosts, much as we'd like the multiplayer to pack in a little more creativity (the maps' dynamic events notwithstanding).

New to the series are tweaks to the game's "earned experience" in multiplayer, where you now customize your character by spending "squad points" to buy all kinds of new models, guns, perks, and other fun. Creating clans and squaring off against others is similarly simple. The game's "operations," or milestones you perform within multiplayer, are not—they first have to be selected in order for you to contribute to them, a fact we learned only after sinking quite a few hours into shooting others.

A new Extinction mode in Ghosts feels like a simplistic Left 4 Dead, an addition that could have just as easily been farmed out to a third-party modder (or two) and released as an after-the-fact (free) DLC. This rehashing of Call of Duty's Zombies mode is about as intriguing as Ghosts' new Squads mode, a means by which you—and human or AI teammates—can square off against another person's AI-created squad. It's an overly complicated setup that feels more like an easily exploitable multiplayer training mode than anything else. We're confused by its necessity, especially when resources for that—or Extinction—could have been better spent beefing up the game's primary multiplayer components.

Here's the deal: If you love everything Call of Duty stands for, this review is meaningless. You've already bought Ghosts. If you've never played a single game in the franchise, then you'll get a fine Call of Duty experience with Ghosts, though you might want to check out its predecessor, Call of Duty: Black Ops 2, for a more engaging (and inexpensive) single-player campaign.

However, if you're on the fence, just go ahead and stay there—buy a real dog, instead. **–DAVID MURPHY**

VERDICT
6

Call of Duty: Ghosts

STAR FOXES Pretty visuals; dynamic multiplayer maps mix up the frag-fests; kitchen sink–like creativity for some of the single-player campaign's brief extras.

SPACE DOGS Poor plot; not all that stealthy; linear single-player gameplay is a bit easy and dull; multiplayer cruft in Extinction and Squads modes.

$60 (digital and retail), www.callofduty.com, ESRB: M

Battlefield 4

Epic battles. Epic bugs, too

STOP. ANY REVIEW you previously read about Battlefield 4 was flat-out wrong. Wrong, we tell you. That's because any short review based on near-gold code or just a few hours or even a day's worth of play can't be complete. In fact, we don't even consider this review anywhere near done yet, even though by the time you read this, we'll have logged days of in-game play. To pronounce a verdict on a game this sprawling, this complicated, this organic—and this frakking bug-filled—would be irresponsible.

This shouldn't be news to anyone who has been a fan of the Battlefield series, though. It's hard to believe, but it's been almost 12 years since Battlefield 1942 hit the store shelves with its unique blend of first-person and vehicle combat that revolutionized military-themed shooters. Unfortunately, there was this little game franchise called Call of Duty released a year later that minted money faster than, well, the US Mint, and the two have been competing ever since.

The last couple of versions, Battlefield has been chasing CoD and it's no different here. Developer DICE again invests resources into a CoD-like single-player storyline that we honestly think few will ever play. We can burn a paragraph or two describing the plot but it's easily summed up as a bad Michael Bay action movie seen through the eyes of *South Park*: "Booosh!" "Fwraaash!" "Craaaw!" "Kraaaaasssshhhh!!!" Slow-motion helicopter crash. "Caawwwshhh!!!"

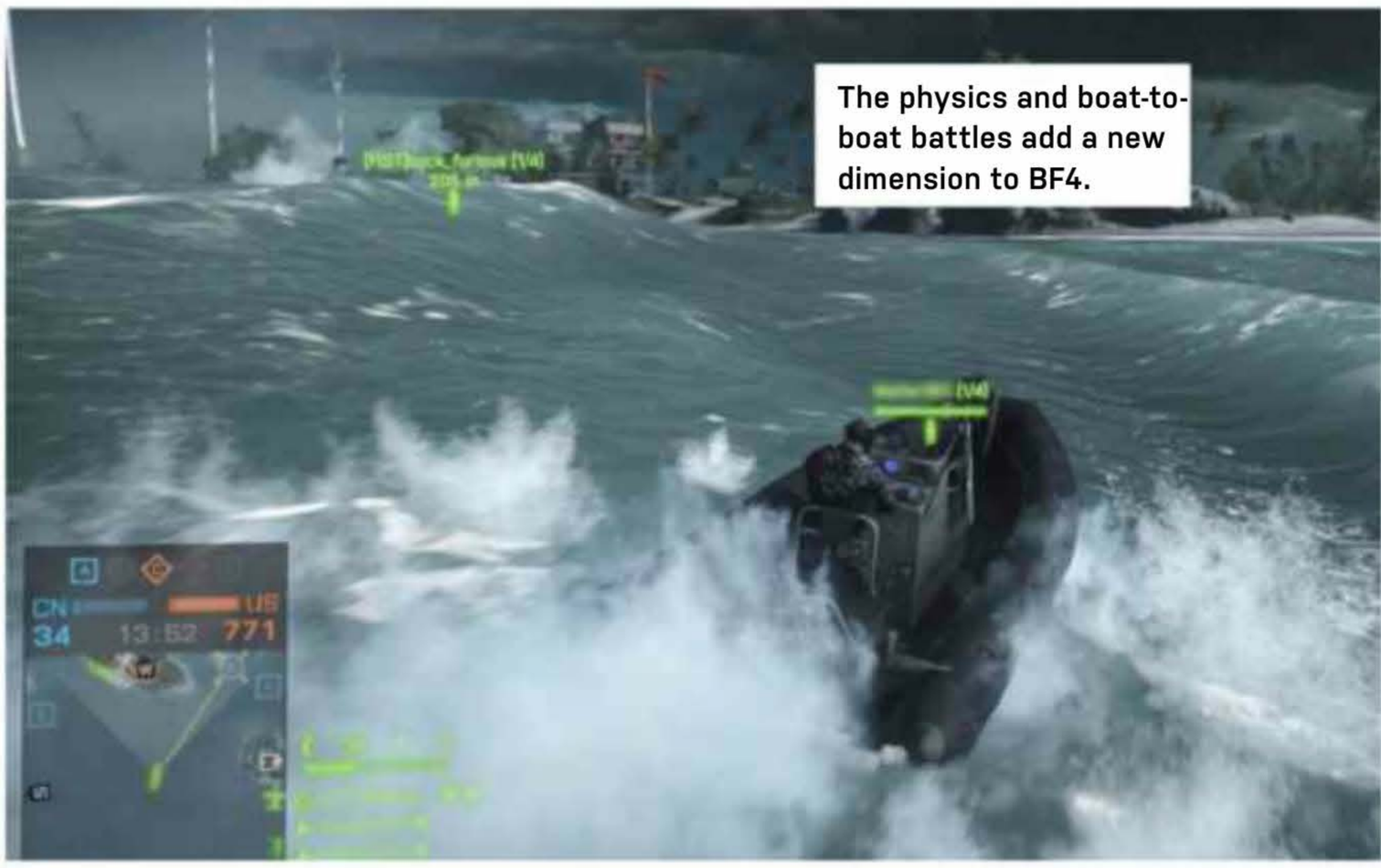
To be fair, the single-player's graphics are fairly stunning and more polygons are expended on single-player than multiplayer. The AI is passable and the save-points less offensive to us than they were in Battlefield 3, but we don't really care about the single-player mode and we'd guess the vast majority of long-time Battlefield fans don't either.

We actually suspect that DICE is finally acknowledging that too, so it's good to see that multiplayer gets some nice buffs that help justify the franchise's reputation for being the thinking man's CoD.

Battlefield 2 players belly-ached for *years* when squads got whittled down from six to four, and Commander Mode and voice com were axed in Battlefield 3. With Battlefield 4, DICE ups the squad size to five, which gives them a little more effective fire teams. Squads are also helped with the return of voice com and a Commander Mode, too.

No review of Battlefield 4 can go without mentioning the Levolution feature—which means a lot of things crumble and fall apart. It's the natural evolution of the already destructible environments first tested in select Battlefield 3 maps, and it's quite impressive. We've been in matches where the fighting practically stops while players rush out to get a glimpse of the towering skyscraper crumbling to the ground. Don't be fooled, though—not everything can be flattened. We'd also be remiss if we didn't mention the stunning water and weather physics DICE has implemented, which

The Commander Mode is back, with a tablet version promised for the loneliest job in the game.



The physics and boat-to-boat battles add a new dimension to BF4.

Battlefield 4™
Battlefield 4™ has stopped working
A problem caused the program to stop working correctly. Windows will close the program and notify you if a solution is available.
Close program

Battlefield 4 has been beset by crashes such as this one, and they're only slowly improving.

are reminiscent of the epic sea battles of the original.

It goes without saying that Battlefield 4 is an intense game on hardware resources. The min spec is a dual-core Core 2 or Athlon X2 with 4GB of RAM and Radeon 3870 or GeForce 8800GT and up, or— get this—Intel HD4000 graphics with a 512MB allocated for the frame buffer. The recommended spec is a quad-core Intel or six-core AMD part, 8GB of RAM, Radeon HD 7870 3GB or GeForce GT 660 3GB or better. Our experience says that if you want to play on Ultra at 1080p with a constant 60fps, you'll want an eight-core AMD part or Hyper-Threaded Intel quad-core part with a current-gen $300-tier GPU, and even then, you'll hit patches of 40–50fps in multiplayer on some maps. Let's just say you need real hardware to play this game in all its glory.

Of course, it's hard to say what game hardware works best, as you need a fairly stable platform to even get a feel for it. And right now as we go to print, Battlefield 4 hasn't been stable.

And that gets right into the most controversial part of Battlefield 4: the bugs. Of course, no release of Battlefield has arrived without bugs, but Battlefield 4's launch has been particularly rough. At launch, players were beset with crashes, lost stats, as well as annoyingly constant server crashes and disconnects. Others complained of poor "netcode" failing to register hits on opponents and being shot through walls. Our own experience initially resulted in crashes and disconnects every other match or three. Multiple server-side patches reduced that to the point where we could play for maybe two hours without a crash or disconnect, but they still occurred on occasion and we were victims of the shot-through-the-wall-problem on occasion.

DICE has since patched the server code again and issued a 1GB client patch to address the crashes. Unfortunately, that patch caused more issues, including more crashing, server disconnects, an inadvertent blurring effect, and *lower* performance for some players. For what it's worth, our experience with the patch was a big improvement in server disconnects and crashes. We played a solid four hours with but one game crash and one server crash. We did, however, get the annoying blur.

We won't even get into the minutia of the odd weapons balance. One grenade upgrade, for example, gives you three smaller grenades that have a smaller blast radius than the single basic grenade you start with, but we'd swear the smaller grenade actually has a larger blast radius. Two engineers repairing the light helicopter make it invulnerable to direct multiple long strings of anti-aircraft fire, too. And many of the weapons seem to be chosen straight from *Jane's Compendium of Obscure Small Arms of the World* rather than the familiar armory from Battlefield 3.

So, where does that leave us? Kind of torn, honestly. From the hours we've logged, we do love the game. It's fun and the immense three-dimensional battle space is everything a Battlefield player wants and needs. Let's just say we won't be playing much Battlefield 3 from now on. But that's contingent on Battlefield 4 working—and often it isn't.

Yet we have faith that DICE will make it right. Battlefield 4, after all, isn't about getting your $60 today and moving you along PT Barnum–style. No, it's about getting your $60 today, and another $50 for the DLC, plus $28 for all of the weapon-unlock packs—right up until Battlefield 5 comes along. Call us suckers, but we'll probably be there too, lined up with our 60 bucks in hand.

–GORDON MAH UNG

VERDICT 8

Battlefield 4

ANT Immense fun; beautiful graphics and water effects.

ARACHNID Enough bugs to qualify for a *Starship Troopers* sequel.

$60, www.battlefield.com; ESRB: M

LAB NOTES

JIMMY THANG **ONLINE MANAGING EDITOR**

Hands-on: Shield Gamepad Mapper

It's a step in the right direction but there's still much to improve

I REALLY LIKED the Nvidia Shield when I reviewed it back in the November issue, but it had a few issues. One of my biggest gripes was that, of the thousands of Android games available, only about 140 were supported by the Shield's controller at launch. Now, Nvidia is attempting to address this issue with a new utility called Gamepad Mapper that lets users manually map game controls to the Shield's controller. I've been playing around with the Mapper and it largely works, but there are definitely some kinks that need to be addressed.

First off, Nvidia doesn't include an on-screen tutorial that shows you how to use the Gamepad Mapper. The only resource we found was online at http://bit.ly/shieldmap. Here's how it works: When a supported game is launched, a notification appears on-screen. Next, you hold down the Shield's start button, and from there you can drag-and-drop the Shield's controls to align with the in-game touchscreen controls. You can even create different swipe gestures and easily map them to buttons.

Unfortunately, mapping out the controls can be unintuitive at times because some titles don't show you how many buttons they use, and don't indicate where you should map them. While a title like NBA Jam features user-friendly overlays showing you where to drag the controls, a title like Need for Speed: Most Wanted just looks like a blank canvas, so it's a guessing game as to how you're supposed to map the controls to specific buttons.

We wish all games were as easy to manually map out as NBA Jam.

Another problem is that the mapper is supposed to allow you to download controller presets from Nvidia's cloud server, but we couldn't get it to work. Instead we got a message that read, "Cannot find a mapping, please check later." We were able to create manual presets ourselves and email them to other Shield owners to download, however.

Suffice to say, the Gamepad Mapper experience is a little janky at the moment, but at least it's a step in the right direction. Once all the bugs are ironed out, the Shield will be a much more compelling experience.

Josh Norem

Senior Editor

This month was spent staring at fan-speed tachometers and trying to figure out what is the most effective procedure for testing GPUs where performance is directly tied to temperature. The Radeon R9 290X is what started it all, as it has a tendency to hit its maximum temperature and clocks of 94 C and 1,000MHz and then begins to throttle. If it can't cool off enough, it'll drop its clocks as low as 700MHz or so, which can greatly affect performance. We've also begun pre-warming cards before testing now, too, just to make sure they are in a "real-world" setting before tests begin.

Katherine Stevenson

Editor-in-Chief

If you're a regular reader of *Maximum PC*, you'll notice that we've revamped our Lab Notes section, giving it an additional page of content yet reducing the number of highlighted editors each month. The reason is this: We want to go a little more in-depth on the goings-on in the Lab. By featuring fewer editors each month, we have more space to tell you about the cool stuff we're working on. Also, the page on the right will now host hardware previews, benchmarking discussions, long-term testing results, and the return of Geek Tested. It's a small redesign, but you could call it a Lab-or of love.

First Look:
AMD Radeon R9 290

Little Hawaii offers big performance

THIS MONTH, we got to take an in-depth look at AMD's second "Hawaii" GPU, the $400 R9 290. This all-new card slots in right below the company's flagship board, the $550 R9 290X. The only difference between the two cards is that the R9 290 has a lower base clock by a miniscule 53MHz, and has 256 fewer Stream Processors, and that's it. Otherwise the two cards are exactly the same, with both of them rocking the fat Hawaii GPU die, 4GB of memory with a 512-bit memory bus, an 11-inch form factor, TrueAudio and Mantle support, and the company's all-new PowerTune voltage and clock-speed control. These controls allow the card to spin up to a pre-determined temperature that you can tweak in software, then it throttles the clock speeds and voltages on the fly to maintain the appropriate temperature.

Since the R9 290X was designed to take on the GTX Titan, that leaves the R9 290 to scrap with the GTX 780, which Nvidia recently demoted from a $650 card to a $500. With the R9 290 costing less, you could expect it to perform slightly less too, but that is definitely not the case. In testing, we found the R9 290 to run neck-and-neck with the more expensive GTX 780 at 2560x1600. Of our 10-game test suite, the AMD card took top honors in three games, Nvidia won by a razor-thin margin in six others, and the two tied in Crysis 3. These cards are literally eyeball-to-eyeball and worthy adversaries, at least when it comes to performance.

Where these two cards are extremely far apart is in heat and noise, with Nvidia holding a sizeable advantage. AMD has pushed its GCN architecture to the absolute limits on the R9 290(X) GPUs, so when the GPU is under load it will run all the way up to 94 C, which is hotter than any GPU we have ever tested. In AMD's defense, the card was 100 percent stable at this temperature, and didn't heat up components inside the case either, thanks to the GPU's efficient blower-style cooler. But when it reaches its maximum temperature of 94 C, the card begins to throttle, and that affects performance. Cooling and temps are directly related to performance, so the cooler the card is, the longer it can stay at maximum clock speeds, but on both the R9 290 and R9 290X that's not very often. What happens is the card will hit its maximum clock speed of 947MHz as soon as you put a load on it, but once it reaches 94 C it begins to throttle a bit, typically dipping down to 900MHz on average, though it could go as low as 800MHz, but we never saw that in testing. The highly active cooler makes the card noisier than the Nvidia GTX 780, but the noise was never more than just slightly above quiet in our opinion, and is not a deal breaker.

In the end, if you don't mind a teeny bit of noise and heat, the R9 290 offers performance Nvidia simply can't match at this price point. We cannot wait to get some in with third-party coolers on them, to see what improvements can be made in temps, noise, and maybe even a bit of overclocking. **–JN**

The R9 290 is the new title holder in the dollars-per-frames-per-second competition.

GEEK TESTED & APPROVED

ModRight Mod-Mat Xtreme

Antistatic mats tend to be pretty utilitarian, but not ModRight's Mod-Mat Xtreme. This slick and informative mat actually serves three roles for builders. First, its thick, rubbery composition safely cushions painted surfaces from marring or scratching. Second, it features two mounting points for grounding straps. Third, rather than a boring black surface, the Mod-Mat Xtreme features useful 1:1 diagrams of commonly referenced information. Examples include which wires are the ground on your 24-pin ATX main power connector, a tubing-size chart, a compression-fitting table, a radiator reference chart, and an integrated ruler. There are also reference illustrations for AMD and Intel CPU sockets, as well as their measurements. We'd like to see diagrams for front-panel and USB/fan-header layouts, but overall, the Mod-Mat Xtreme will make any work surface seem more professional. It's available in two sizes: a 47x23-inch Xtreme size, and a smaller MainBoard version that's 23x23 inches. $40/$60, www.modright.com **–GU**

LETTERS

WE TACKLE TOUGH READER QUESTIONS ON...

> Dual Power Supplies
> HDD MTFB
> Space Odyssey Predictions

Doubling up on PSUs

Regarding the reader letter "Feeding the Beast" (November 2013): I like Howard Wong's solution (powering a PC with two PSUs fed from appropriate 120V lines), but what's the proper way to connect two PSUs to a single PC? Do adapters like Add2Psu work? Are precautions needed so the PSUs don't zap each other or the computer?

—Paul Hambourger

DEPUTY EDITOR GORDON MAH RESPONDS: I haven't actually seen Add2PSU in action but it seems like another good way to operate two PSUs. We have had success using cables such as the ModRight Dual Power Supply Adapter Cable. The cable essentially connects to a second PSU and trips the power good signal when the machine is turned on, which tells the second PSU to fire up. Another option that doesn't seem as popular anymore is a bay-mounted PSU. In fact, we used a unit in our 2010 dual-Xeon Dream Machine when the single PSU wasn't enough. It's not pretty, but it works. I've not had any problems running dual PSUs, but to be frank, I don't have a million hours on them, either. Typically, they're fine, the only issue I've had tripping PSUs manually with, say, a PSU tester, is that they tend to load up and get rather hot after long periods of time. The real problem is if you're already up at 1,600 watts and really getting to the limit of the single 15-amp circuit, which is pretty common in American homes. Unless you're going to run a heavy-gauge cable to another circuit or run it downstairs plugged into your 220 dryer outlet, adding the second PSU may not actually help you.

WTF MTBF?

I enjoyed reading the "Become a Hardware Expert" article (August 2013). But I would like to point out a spec that was missing from the Hard Drive section: MTBF (mean time between failure). I recall listening to a Maximum PC Podcast where it was said, "There are two kinds of hard drives. Those that are about to fail and those that have failed." Should MTBF be factored into an HDD purchase, or has it become an irrelevant spec?

—John Spaine

SENIOR EDITOR JOSH NOREM RESPONDS: You are correct that we don't typically list MTBF for consumer drives, as most manufacturers don't list that spec for consumer drives anymore. In my opinion, it's an irrelevant spec because we've seen some drives fail right out of the box, other drives fail after several years of operation, and some drives are still going even after a decade of use.

There is no guaranteed method for predicting how long a hard drive will last, and even MTBF is just a guess, but is certainly not a guarantee. We did some digging on your behalf, though, and found that both Seagate and WD do list it for their enterprise-level drives (but not for consumer models). For example, on its WD Red drives, it lists 1,000,000 hours, which is 114 years, and its VelociRaptor 10K SATA drives are listed at 1.4 million hours. Seagate no longer lists MTBF but instead lists AFR, or annualized failure rate. For its enterprise drives, such as the Terascale model, it lists it as <1.1 percent.

Speaking for myself, this is a spec you shouldn't pay any attention to, as in the real world it has zero relevance for when a drive may or may not fail, so disregard it and do what I do: Keep at least two backups of everything that is important to you.

Why No Google Drive?

I love the magazine. I've subscribed for years. The November 2013 issue bothered me, though. Why was Google Drive overlooked in the cloud storage roundup? It's one of the best options out there.

—AJ Boonstra

CONTRIBUTING WRITER DAVID MURPHY RESPONDS: Egg on the face! Here we were, so busy trying to find other cloud-storage services, that we neglected to take a look at the one we use on a fairly regular basis.

Here's a quick overview: Google Drive gives you 15GB of free storage space for, well, just about everything. It synchronizes excellently with Google's other products—a must-have if you want to share huge files via Gmail, for example. Maximum file sizes top out at 10GB, and that which you upload can be easily shared with others via links or direct invites. A handy little app lets you access your

↘ submit your questions to: comments@maximumpc.com

cloud storage right from File Explorer itself—convenient! It's one of the best cloud storage apps around, though it's a smidgen pricier for additional storage ($60 yearly for 100GB). Given how nicely SkyDrive integrates within 8.1, there's certainly competition there.

—David Murphy

HAL and the First DVR

In reference to the article "8 Movies That Predicted the Tech Future" (The List, November 2013), you stated the computer HAL was an early form of Siri. Talking computers were already a part of science-fiction movies, as well as TV shows, short stories, and novels long before this film. You missed a better reference. At approximately 58 minutes into *2001: A Space Odyssey*, two Jupiter-bound astronauts (played by Keir Dullea and Gary Lockwood) sit down to a meal. Mostly, the scene shows off the food-dispensing machine, and the flavored goo the astronauts are "enjoying." While they eat, they are viewing a news broadcast. The ship is too far out from Earth to watch it live, so HAL has recorded it, and is streaming it to them on two tablets. This is the first movie reference I remember for both the tablet device and streaming video. (Please note: I said the first I remember. I don't claim to have seen every movie ever made!)

—S. Clark

Not Down with DRM

I read Tom McDonald's column recently ["The End of Ownership," October 2013] and just had to say there are a number of reasons why the sort of DRM he sees as nothing to fear is a PITA for some people. First of all, what exactly was the money we exchanged for these titles for? Rental or ownership? If I pay $60 to get the new GTA, I'd better be able to play it if cable goes out. Needing an always-on connection means that if the Internet goes down or you get disconnected, you can't play the game, meaning you paid a long-term rental fee. Also, what about gamers who might just want to use a console as a console? I find it rather ironic that the device typically connected to the Internet, the computer, offers way more gaming freedom than gaming consoles. With computers, there are hacks and patches you can use to force offline mode to work, or to bypass checking security, etc. I especially like the no-CD hacks. Why we still need to have the disc in the drive for some games is beyond me. It's silly and annoying. I started gaming on the TSR-80, so I remember when things like that made sense. They don't any more. The gaming industry needs to get with it and either make the changes the rest of us want or stop complaining we aren't buying their systems anymore. I haven't had a gaming console since Nintendo (original) but after my next PC build I'm considering the PS4. Hopefully, I won't be forced to have an Internet connection to verify the DRM in order to game.

—Adam Smith

CONTRIBUTING EDITOR THOMAS L. MCDONALD RESPONDS: Nobody "likes" DRM, but if it's the price we have to pay for untethering content from physical media and delivering it on demand, it's a pretty small one. I already voluntarily choose DRM by opting for Steam for almost 100 percent of my gaming content, because it's convenient and efficient. And if you think returning to ownership of hard media is a grand thing, I have a box of datasettes I'd like to sell you.

[NOW ONLINE]

WHAT'S THE BEST MUSIC-STREAMING SERVICE?

With so many music-streaming services like Pandora, Slacker Radio, and Spotify out there, it's hard to know which option to go with. Which one offers the most songs? Which services allow you to play specific tracks on-demand? To answer these questions and get the definitive answer on what's worth listening to, check out our music-streaming services roundup online at http://bit.ly/mpcmusic.

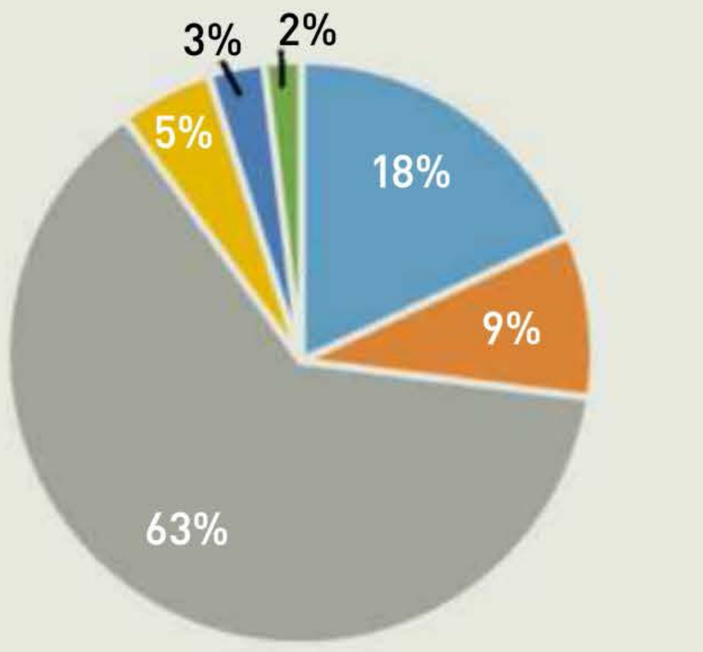
Facebook Polls

How Would You Run Microsoft?

With Steve Ballmer on his way out and several bigwigs jockeying for control of Microsoft, we asked our readers what they would do first if they were in charge.

Mario Ramalho: Break Windows 8 into two OSes, for desktop and mobile.
Sean Piper: Stop focusing on mobile; focus on PC/server, like in the past.
Jim Pierce: Focus on PC as a gaming platform.
Gordon Dowden: Listen to customers more often.
John Gustin: Slow down on Windows OS releases.
Timothy Bennett: Open-source Windows.
Troy Braghini: Sell Bing and all mobile assets; focus on desktop/OS/Office/Xbox.
Ralph LaVerne Bowers Jr.: Support Windows XP for a few more years.
Anthony John Wheeldon: Fire all the executives.
Sina Hamedian: Kill Windows RT. Then kill it again.
Chris Dunphy: Stop chasing Apple; figure out what it means to be Microsoft.
Kamel Kamel: Focus on the PC market rather than failing in the tablet war.
Jason Li: Hire the *Maximum PC* staff.
Jacob Weber: Make command-line use forward-slash instead of backward-slash.
John Piddock: Sh*t my pants probably.

What OS Are You Using?



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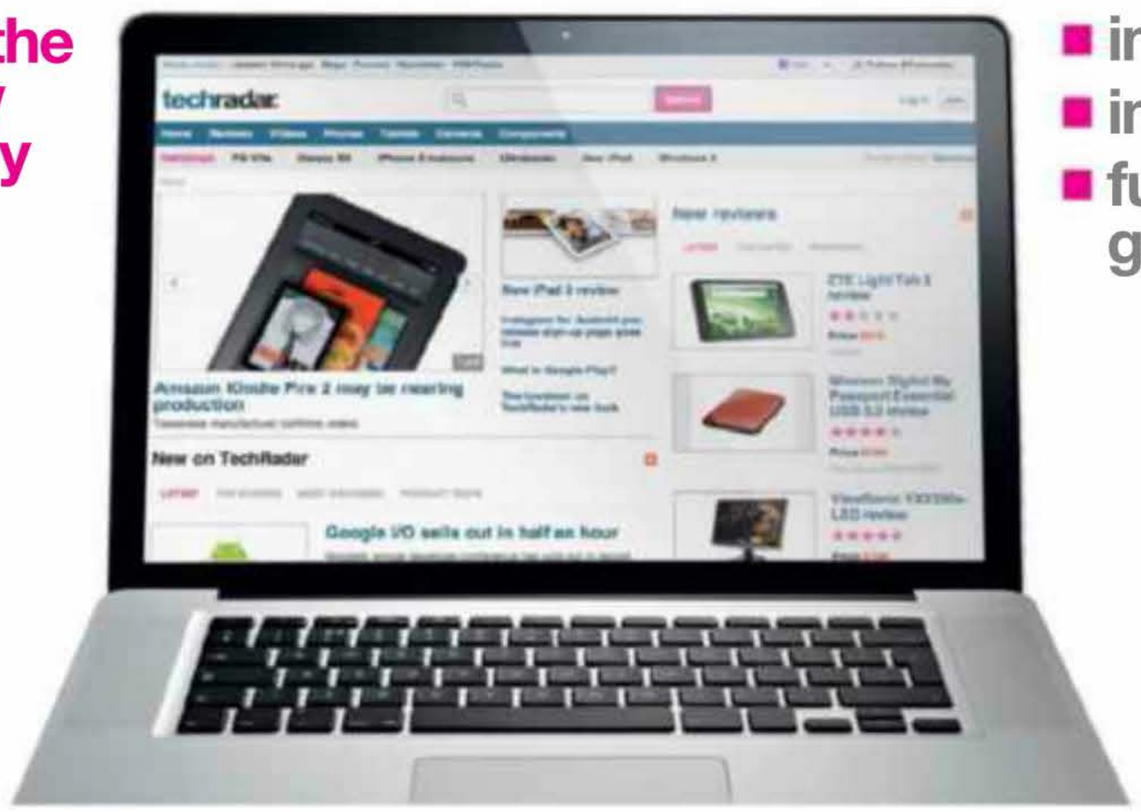

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THE BUILDS

WE'RE TRYING something different this month by switching our CPU from Intel to AMD. The FX-6300 appears to be a better value at first, since it costs about $120, while the Core i5-4430 we used previously is around $180. We like to overclock though, so we needed a fancier mobo and CPU than the Core i5-4430 combo we were using, as well as an aftermarket CPU cooler. Add in price fluctuations elsewhere in the build, and we were able to upgrade *and* save $16 overall. We took that cash and spent it on another upgrade, going from a 1GB Radeon HD 7790 to a 2GB Radeon HD 7850. The Corsair CX500M power supply we used previously is no longer available, so we swapped it with a quality 500W unit from PC Power and Cooling.

INTEL DOESN'T have as much competition at this semi-powerful tier, so we're holding firm with its Core i5-4670K and a Gigabyte Z87X-UD3H motherboard. This build uses the most current-generation Intel enthusiast platform, Haswell and Z87, so it offers six native SATA 6Gb/s ports and integrated voltage regulation. The Radeon HD 7950 may be discontinued by the time you read this; the GeForce GTX 760 is a similar alternative. The Fractal Design Define R4 case we used before is no longer on sale, so we've switched to the militaristic Corsair Vengeance C70. The Seasonic SS-650KM PSU sale is over, so the Cooler Master Silent Pro M2 is a fine alternative. Finally, the Intel 530 Series SSD was on sale this month, so we swapped it for the 335 model.

PERFORMANCE

THIS SYSTEM is a bit tricky. If we dropped the solid-state drive from 500GB to 250GB, traded the Blu-ray drive for a DVD burner, and maybe made a couple of cuts elsewhere, we could upgrade from the quad-core Core i7-4820K to the hexa-core Core i7-4930K. It all depends on what you want to use this system for. If it's primarily gaming, you'll benefit more from the extra storage space than the additional CPU threads. A Steam/Origin library can take up a ton of space. If you do a lot of video encoding and other highly threadable tasks, then the hexa-core would make more sense. Since we like the extra storage, we stuck with the quad-core.

Regardless of your CPU plans, you'll still benefit from the AMD-Nvidia sale-pocalypse, which has delivered a big upgrade from the GeForce GTX 780 video card we previously had in this build. This new "Ti" flavor is the fastest single-GPU card on the market, and costs just $30 more than what we were paying before. Yes, it's even speedier than Titan, for $300 less.

For more of our component recommendations, visit www.maximumpc.com/best-of-the-best.

INGREDIENTS

PART		PRICE
Case	NZXT Phantom 530	$130
PSU	XFX 850W P1-850B-BEFX	$115
Mobo	Asus Sabertooth X79	$307
CPU	Intel Core i7-4820K	$320
Cooler	Corsair H80i	$92
GPU	EVGA GeForce GTX 780 Ti NEW	$700
RAM	4x 4GB G.Skill Ares Series DDR3/1600 NEW	$120
Optical Drive	Asus BW-12B1ST	$60
SSD	Samsung 840 Evo 500GB	$330
HDD	Seagate Barracuda 3TB	$118
OS	Windows 8 64-bit OEM	$96

Approximate Price: $2,388

UPGRADE OF THE MONTH

AMD RADEON R9 290

AMD showed in October that it has more than next-gen consoles up its sleeves. Its Radeon 290 and 290X video cards combine extreme beefiness and interesting new features like Mantle and TrueAudio with aggressive pricing and a bundled copy of Battlefield 4, which will probably have Mantle support by the time you read this.
$400, www.amd.com

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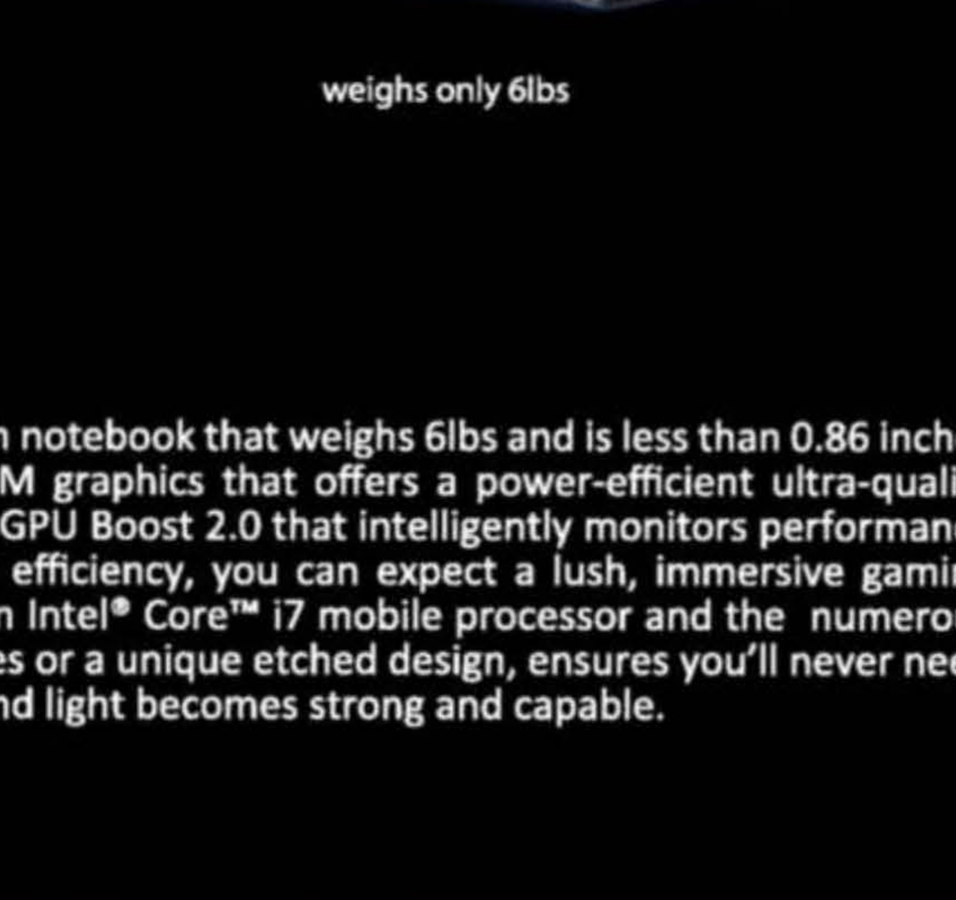
0.86 inches thick



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